THE

JOURNAL

OF

THE LINNEAN SOCIETY.

BOTANY.

VOL. XVII.

LONDON:
SOLD AT THE SOCIETY'S APARTMENTS, BURLINGTON HOUSE,
AND BY
LONGMANS, GREEN, READER, AND DYER,
AND
WILLIAMS AND NORGATE.
1880.

Dates of Publication of the several Numbers included in this Volume.

No. 98,	pp. 1–87,	was published	July 31, 1878.
,, 99,	,, 87–172,	,,	November 5, 1878.
,, 100,	,, 173–268,	,,	December 31, 1878.
,, 101,	,, 269–332,	,,	May 20, 1879.
,, 102,	,, 233–404,	,,	August 20, 1879.
,, 103,	,, 405–510,	,,	October 1, 1879.
,, 104 } ,, 105 }	,, 511–607,	,,	March 30, 1880.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

LIST OF PAPERS.

Page

ABBAY, The Rev. R., M.A., F.G.S., Fellow of Wadham College, Oxford.

Observations on *Hemileia vastatrix*, the so-called Coffee-leaf Disease. (Plates XIII. and XIV.) (Communicated by W. T. THISELTON DYER, M.A., F.L.S.) 173

ALLMAN, Professor, M.D., LL.D., F.R.S., President Linnean Society.

Note on the probable Migration of *Pinguicula grandiflora* through the Agency of Birds 157

BAILEY, F. MANSOR, F.L.S. &c. (of Brisbane, Queensland).

Remarks on *Carpesium* as indigenous to Australia............ 345

BAKER, J. GILBERT, F.R.S., F.L.S.

A Synopsis of the Hypoxidaceæ 93

A Synopsis of Colchicaceæ and the Aberrant Tribes of Liliaceæ. 405

BAKER, J. G., F.R.S., F.L.S., and S. LE MARCHANT MOORE, F.L.S.

A Contribution to the Flora of Northern China. (Plate XVI.) 375

BALFOUR, Dr. ISAAC BAYLEY, F.L.S., F.R.S.E., &c.

Observations on the Genus *Pandanus* (Screw-Pines); with an Enumeration of all Species described or named in Books, Herbaria, and Nurserymen's Catalogues; together with their Synonyms and Native Countries as far as these have been ascertained 33

BENNETT, ALFRED W., M.A., B.Sc., F.L.S., Lecturer on Botany at St. Thomas's Hospital.

Notes on Cleistogamic Flowers; chiefly of *Viola*, *Oxalis*, and *Impatiens*. (With 15 woodcuts.).................. 269

BENTHAM, GEORGE, F.R.S., F.L.S.

Notes on Euphorbiaceæ 183, 371

Page

BERKELEY, the Rev. M. J., M.A., F.L.S.

Enumeration of the Fungi collected during the Arctic Expedition 1875-76 13

BERNAYS, LEWIS, A., F.L.S., Vice-Pres. Queensland Acclimatization Society.

On the Existence of *Carpesium cernuum* ?, Willd., in Queensland, in a Letter addressed to the Society's Secretary 267

BROWN, N. E., Herbarium, Royal Gardens, Kew.

The Stapelieæ of Thunberg's Herbarium, with Descriptions of four new Genera of Stapelieæ. (Plates XI. and XII.) (Communicated by Prof. OLIVER, F.R.S., F.L.S.) 162

CLARKE, CHARLES BARON, M.A., F.L.S.

On two kinds of Dimorphism in the Rubiaceæ. (With 4 woodcuts.) 159

Note on *Gardenia turgida*, Roxb. (With 3 woodcuts.) 310

Ferns of North India. (Abstract.) 402

COOKE, M. C., A.L.S.

The Fungi of Texas. (Abstract.) 141

CROMBIE, the Rev. J. M., F.L.S. &c.

Enumeration of Australian Lichens in Herb. Robert Brown (Brit. Mus.), with Descriptions of new Species 390

On the Lichens of Dillenius's 'Historia Muscorum,' as illustrated by his Herbarium 553

DARWIN, FRANCIS, M.B., F.L.S.

Experiments on the Nutrition of *Drosera rotundifolia* 17

Additional Memorandum concerning the Nutrition of *Drosera rotundifolia* 32

DICKIE, Prof. GEORGE, M.D., F.L.S.

On the Algæ found during the Arctic Expedition 6

Notes on Algæ from Lake Nyassa, E. Africa. (With a woodcut.) 281

DYER, W. T. THISELTON, M.A., B.Sc., F.L.S.

Note on the Fruiting of *Wistaria sinensis* in Europe 329

FRIES, THEODOR M., Professor of Botany in the University of Upsala.

On the Lichens collected during the English Polar Expedition of 1875–76. (Communicated by Sir JOSEPH HOOKER, C.B., F.R.S.) 346

HARTOG, MARCUS M., M.A., B.Sc., F.L.S.

Some Morphological Notes on certain Species of *Thunbergia* 1

Page

HENSLOW, the Rev. GEORGE, M.A., F.L.S., F.G.S.
On the Absorption of Rain and Dew by the Green Parts of Plants 313
On the Origin of the so-called Scorpioid Cyme. (Abstract.) .. 511

HOOKER, Sir JOSEPH D., C.B., K.C.S.I., F.R.S.
On the Discovery of a Variety of the Cedar of Lebanon on the Mountains of Cyprus, with Letter thereupon from Sir Samuel Baker, F.R.S. 517

KING, GEORGE, M.B., F.L.S., Superintendent Royal Botanic Gardens, Calcutta.
On the Source of the Winged Cardamom of Nepal 3

LOCKWOOD, E., Esq.
Notes on the Mahwa Tree (*Bassia latifolia*). (Communicated by THOS. CHRISTY, F.L.S.) 87

LYNCH, R. IRWIN, of Kew Gardens.
On the Mechanism for the Fertilization of *Meyenia erecta*, Benth. (With a woodcut.) (Communicated by Dr. J. MURIE, F.L.S.) 145
On the Seed-Structure and Germination of *Pachira aquatica*. (Plate VIII.) (Communicated by Dr. J. MURIE, F.L.S.) .. 147
On Branch Tubers and Tendrils of *Vitis gongylodes*. (Plate XV. and woodcut.) (Communicated by Dr. J. MURIE, F.L.S.) .. 306

MARSHALL-WARD, see under WARD.

MASTERS, MAXWELL T., M.D., F.R.S., F.L.S., &c.
Note on the Occurrence of a Restiaceous Plant in Cochin China 343
Note on the Relations between Morphology and Physiology in the Leaves of certain Conifers 547

MEEHAN, THOMAS, Esq., Germantown, Philadelphia.
On the Laws governing the Production of Seed in *Wistaria sinensis*. (Communicated by the Rev. G. HENSLOW, F.L.S.) 90

MIERS, JOHN, F.R.S., F.L.S., &c., Dignit. and Commend. Ord. Imp. Bras. Rosæ.
On the *Schoepfieæ* and *Cervantesieæ*, distinct Tribes of the Styraceæ. (Plates I.–IV.) 68
On some Genera of the Olacaceæ. (Plates V.–VII.) 126
On *Marupa*, a Genus of the Simarubaceæ. (Plates IX. and X.) 148
On the Symplocaceæ 283
On some South-American Genera of uncertain position, and others not recognized by Botanists 333
Notes on *Moquilea*, with a Description of a new Species 371

Page

MOORE, S. LE MARCHANT, F.L.S., and J. G. BAKER, F.R.S., F.L.S.
A Contribution to the Flora of Northern China. (Plate XVI.) 375

MORRIS, D., B.A. Trin. Coll. Dubl., F.G.S., Director of the Botanical Department, Jamaica, late on special duty, Coffee-leaf Disease Inquiry, Ceylon.
Note on the Structure and Habit of *Hemileia vastatrix*, the Coffee-leaf Disease of Ceylon and Southern India. (With a woodcut.) (Communicated by W. T. THISELTON DYER, F.L.S.). 512

PHILLIPS, WILLIAM, F.L.S.
On *Helvella californica*. (Abstract.) 402

STIRTON, JAMES, M.D., F.L.S.
Remarks on Mr. Crombie's Paper on the 'Challenger' Lichens in Journ. Linn. Soc. xvi.................................. 152

TRIMEN, Dr. HENRY, F.L.S.
Note on the Genus *Oudneya*, Brown.......................... 328

WARD, H. MARSHALL.
A Contribution to our Knowledge of the Embryo-Sac in Angiosperms. (Plates XVII.–XXV.) (Communicated by W. T. THISELTON DYER, F.L.S.) 519

WEALE, W. MANSELL.
Note on South-African Orchids. (Communicated by Sir J. LUBBOCK, Bart., M.P., and abridged.).................... 313

EXPLANATION OF THE PLATES.

Plate			
I.	Schoepfia arborescens.—Portion of plant and floral anatomy.		
II.	Schoepfiopsis acuminata.	do.	do.
III.	Cervantesia Kunthiana.	do.	do.
IV.	Iodina rhombifolia.	do.	do.

To illustrate Mr. J. Miers's paper on tribes of Styraceæ.

V	Myoschilos oblonga.—Plant and dissections of flower and fruit.		
VI.	Arjona rigida.	do.	do.
VII.	Quinchamalium chilense.	do.	do.

To illustrate Mr. Miers's paper on the genera of the Olacaceæ.

VIII. Pachira aquatica.—Germination, cotyledons, and young plants, as described by R. Irwin Lynch.

IX. Marupa Francoana.—Branch with inflorescence and diagrams of flower and seed.

X. Marupa Paraensis.—Raceme, calyx, fruit, and seed.
As illustrative of a genus of the Simarubaceæ by J. Miers.

XI. Stapelieæ, viz. *Trichocaulon piliferum*, *T. flavum*, *Boucerosia mamillaris*, *B. incarnata*, and *Stapelia hirsuta*.

XII. Stapelieæ, viz. *Diplocyatha ciliata*, *Sarcocodon speciosus*, and *Huerniopsis decipiens*.

Flowers and dissections illustrating Mr. E. Brown's paper on the Stapelieæ of Thunberg's Herbarium, and new genera.

XIII., XIV. Hemileia vastatrix.—Coffee-leaves with disease-spots, sporanges, mycelium, and spores, illustrating the Rev. R. Abbay's paper on the Coffee-Leaf Disease of Ceylon.

XV. Vitis gongylodes.—Branch-tubers and tendrils, in illustration of Mr. R. Irwin Lynch's paper thereon.

XVI. New Species of *Anemone*, *Leontice*, *Viola*, *Dracocephalum*, and *Betula*, in illustration of Messrs. Baker and Moore's Flora of Northern China.

PLATE
XVII. BUTOMUS UMBELLATUS.
XVIII. ,, ,,
XIX. ,, ,,
XX. ALISMA PLANTAGO.
XXI. ANEMONE JAPONICA and LUPINUS VENUSTA.
XXII. ŒNOTHERA BIENNIS and PYRETHRUM BALSAMINATUM.
XXIII. PYRETHRUM BALSAMINATUM.
XXIV. ,, ,, and ANTHEMIS TINCTORIA.
XXV. ANTHEMIS TINCTORIA, VERBASCUM PHLOMOIDES, and LOBELIA SYPHILITICA.

(Plates XVII.–XXV.) Illustrating the minute structure and development of the ovule and embryo-sac of Angiosperms, according to the researches of Mr. H. Marshall Ward.

ERRATUM.

In Plate XVI., and description of same, p. 390, for "*Betula exaltata*" read "*Betula exalata*."

THE JOURNAL

OF

THE LINNEAN SOCIETY.

Some Morphological Notes on certain Species of *Thunbergia*.

By Marcus M. Hartog, M.A., B.Sc., F.L.S.

[Read December 21, 1876*.]

The floral development of this genus has only been cursorily studied by Payer†, who refers to that of the gynæcium in *Thunbergia alata*. As there are other points of interest, both as regards the calyx and the plurality of buds in a single axil, while the latter phenomenon has alone been studied in its later stages in the general papers of M. Guillard‡ and MM. Damaskinos and Bourgeois§, the following notes may be of interest:—

In *T. laurifolia* we find that the adult flowering node is compressed at right angles to the opposite bracts, which finally become reflexed. In each axil is a vertical series of flowers, younger as they approach the bract, symmetrical in number and age with their fellows of the opposite axil. They have been described as "whorled;" but this expression is as incorrect as that of "fascicled," if the latter word be confined to its strict sense. For though torsion of the pedicel disguises the true relations of the adult flower, even comparatively advanced buds show that all the flowers have the same orientation; *i. e.* the odd petal is anterior or next the common bract; and it is on this side that the valvate bractlets first separate.

* [The absence of the author abroad when this paper was read, and subsequently its slight modification, have led to its publication being deferred.—Ed.]

† 'Organogénie,' 587.

‡ Bull. Soc. Bot. Fr. iv. 937

§ Bull. Soc. Bot. Fr. v. p. 598.

Tracing out the development, we find the first sign of an axillary bud at the sixth or eighth pair of leaves from the growing-point; next, on its hemispherical prominence form two elevations, a little above the base. This latter becomes the pedicel; the basal elevations are the bractlets, and soon become crescentic, enlarge, and cover in the apex of the bud. About this time, at the base of the pedicel, the small elongated area between it and the now broad base of the bract rises up in the centre to form a second bud, which develops in the same way as the first. This process may be repeated four or five times. Each young bud is at its origin lodged in a pit hollowed out in the pedicel of its next elder sister bud, to whose axis its own is at first parallel.

I have observed fundamentally the same relations and development in *T. coccinea*; and, from dried specimens and figures, *T. grandiflora* would come even closer to the type I have just described. In *T. erecta* the mode of development is the same; but the plurality is not so constant, symmetry in opposite axils is not invariable, and often the younger sister to a flower-bud is a vegetative shoot. In *T. alata* and *fragrans* I have never seen more than one younger sister bud. This originates early, but never develops till after the flowering or even seeding of its elder sister-bud.

The anatomical structure confirms fully the view that these buds stand truly in the relation indicated by their development. Each bud has its separate fibro-vascular bundle, which runs apart from the others to join the "common bundle" bending outwards from the stem along the node into the petiole*.

As regards the floral development specially, I have always found the calyx with five teeth, and the posterior one the largest, in the youngest buds where there was any trace of this verticel; and we may conclude that the posterior sepal is the oldest. In *T. laurifolia* and *T. coccinea* ("*calyce annulari truncato*") all trace of teeth disappears before the earliest outgrowth of the petaline and staminal tubercles. But in *T. erecta*, &c., the five teeth may persist till after the closing-in of the ovary, or may soon become inconspicuous: in the former case secondary teeth festoon the intervals between the sepals, in the latter the ring becomes pluridentate; but, save for the posterior tooth, I have been unable to ascertain satisfactorily the genetic relations between the numerous teeth of the adult calyx and the five primary sepals.

* I may here call attention to *Ruellia Herbstii*, which has the same plurality of buds as *Thunbergia laurifolia*; and moreover, the bractlets being fertile, each bud develops into a true fascicle of three, seven, or more flowers.

In all the species I have seen, petals and stamens appear as nearly as possible at the same time, the former being much more conspicuous from their larger size and more ovoid form. The staminode is always formed simultaneously with the other stamens, but is at once distinguishable by its small rounded outline. It very soon disappears, as Payer observed in *Acanthus mollis* (*l. c.* p. 586), the development of which he has traced very fully. The further evolution of *Thunbergia* has no exceptional features to justify a further description.

On the Source of the Winged Cardamom of Nepal. By George King, M.B., F.L.S., Superintendent Royal Botanic Gardens, Calcutta.

[Read November 1, 1877.]

Some years ago, the late Mr. Daniel Hanbury asked me to inquire into the botanical origin of the large brown winged Cardamom, commonly sold in the bazaars of Northern India, and occasionally imported into England, and which had been regarded by Dr. Pereira, in his great work on Materia Medica, as the produce of *Amomum maximum*, Roxb.

A few weeks prior to Mr. Hanbury's lamented death, I sent him the result of my inquiries; but it reached too late to be used by him, and I now therefore put it on record myself.

Dr. Pereira appears to have been led to adopt the view just alluded to, chiefly because the Cardamom imported from Calcutta and the fruit of *Amomum maximum* are both winged. He certainly did not adopt it from any previous authority.

A. maximum, although it was named by Roxburgh, is not indigenous to India, but to Java. Roxburgh himself mentions this fact in his description of the plant ('Flora Indica,' ed. Carey, i. 42). He concludes his description with the remark, "the seeds possess a warm pungent taste, not unlike that of Cardamoms, but by no means so grateful;" but he does not mention the fruit as being sold in Indian bazaars as a Cardamom. Concerning the Indian species which he named *Amomum aromaticum*, Roxburgh states (*l. c.* p. 45) that it is "a native of the valleys on the eastern frontier of Bengal," and that "the capsules are carefully gathered by the natives and sold to druggists, who dispose of them for

medicinal and other purposes, where such spices are wanted, under the name of *Morung Elachi*, or *Cardamon*." Roxburgh therefore (since he mentions no other) appears to have considered the large brown Cardamom of the Calcutta bazaar the produce of a single species, and that species *A. aromaticum*. In the 'Hortus Suburbanus Calcuttensis' (published twenty-five years after the first edition of the 'Flora Indica' appeared), Voigt quotes Roxburgh's statement that the *Morung Elachi* of the bazaars is the produce of *Amomum aromaticum*; but he also mentions a second species (*Amomum subulatum*, Roxb.) as the source of a bazaar Cardamom called the *Bungali Elachi*, and he gives the Khasia hills as its home. Roxburgh, in describing *A. subulatum*, says nothing of its fruit being sold as a Cardamom. He moreover states (and correctly) that it is a native of the Morung Mountains (*i. e.* of the outer ranges of the Nepal Himalaya), and not of the Khasia hills as Voigt states. Both plants were in cultivation in the Calcutta Botanic Garden in Roxburgh's day; and there are still in the Garden library MS. drawings of both made under his direction, and named in his handwriting. *A. aromaticum* seems to have ripened its fruit in the Garden in Roxburgh's time; for he both describes it in the 'Flora Indica' and figures it in the MS. drawing just alluded to. But Roxburgh appears never to have seen the fruit of *A. subulatum*; for he neither describes it in the 'Flora Indica,' nor figures it in his drawing, which was subsequently published in his Coromandel Plants (t. 277). The plants of *A. subulatum* which I have grown have ripened fruit abundantly. Hence I am able now to state that the fresh fruit is about the size of a nutmeg, irregularly obcordate, flattened antero-posteriorly, having 15 to 20 irregularly dentate-undulate wings, which extend from the apex downwards for two thirds of its length; apex depressed and crowned by the persistent 3-cleft perianth-tube, which rather exceeds the ripe fruit in length: irregularly 3-celled, many seeded; seeds surrounded by a sweetish pulp.

Roxburgh was very well informed on economic botany, so much so that since he wrote very little has been added to our knowledge of the uses of Indian plants. It is therefore, I think, a fair conclusion, either that the fruit of *Amomum subulatum* was not sold in Calcutta as a Cardamom in Roxburgh's time, or that he confounded the fruit of this species with that of *A. aromaticum*, and regarded them as one. The conclusion to which Mr. Hanbury came, after going into the matter with his accustomed thoroughness ('Phar-

macographia,' 1874, p. 588), was, *as regards A. maximum*, that in Java "its fruits are sold for the sake of their agreeable edible pulp," and that "we do not know whether the dried fruits or the seeds are ever exported;" and *as regards the North-Indian Cardamoms*, that there are two sorts, the Bengal Cardamom afforded by *A. aromaticum*, and the Nepal Cardamom, the fruit "of a species of *Amomum* that has not yet been identified with any published description."

Having, in order to settle the source of the North-India Cardamoms, procured from the Morung Mountains and from the plains of Eastern Bengal living plants of the species of Cardamom respectively cultivated in those districts, and having grown these at the Government Cinchona-plantation in Sikkim, I was able a week or two after the 'Pharmacographia' appeared, to put Mr. Hanbury in possession of complete specimens, and of a drawing of the plant producing the Nepal Cardamom, and to identify it with Roxburgh's *A. subulatum*. Regarding the identification, Mr. Hanbury wrote as follows:—

20th November, 1874.

"The drawing of *A. subulatum*, and also the specimens, are now in my possession, and are very acceptable. I took the drawing to Kew three days ago, hoping to compare it with one of Roxburgh's; but I failed; for the Roxburgh collection contains no representation of the plant, and the Kew Herbarium has no specimen. There is, however, no doubt regarding the correctness of your determination."

The source of the Nepal Cardamom may thus be regarded as definitely settled.

This Cardamom is pretty extensively cultivated by the inhabitants of Eastern Nepal, and also by a few of the Nepalese who of late years have settled in British Sikkim. It is essentially a swamp-plant, and therefore comes in usefully as a crop for irregular patches of ground by the sides of streams which are unsuitable for any ordinary cultivation except that of rice, than which it is more profitable. This species does not appear to be found in the Khasia hills; so that Roxburgh was right and Voigt was wrong as to its home.

On the Algæ found during the Arctic Expedition.

By G. Dickie, M.D., F.L.S.

[Read December 20th, 1877.]

The following report on Algæ procured during the Arctic Expedition, under the command of Captain Sir George Nares, is founded on collections made by Captain Feilden, Dr. Moss, and Mr. Hart, who were equally assiduous in collecting and observing. Most of the materials submitted to me were procured beyond lat. 78° N.; and the notes embrace those only observed from that to the extreme point reached by the Expedition. As to the Diatomaceæ, the localities where gathered are first given in numbered series, after which comes a list of all the genera and species, with numbers corresponding to the localities attached. This saves needless repetition, is available for data concerning distribution, and at a glance shows paucity or frequency of genera and species.

The concluding summary shows the number of species found as contrasted with those observed at Spitzbergen.

Sporochnaceæ.

Desmarestia aculeata, *Lamour.*

Bessels Bay, 81° 7′ N., from 7 fathoms, and Discovery Bay, 81° 41′ N., from 10 to 20 fathoms; all very dwarf.

Laminariaceæ.

Laminaria longicruris, *De la Pyl.*, and L. caperata, *De la Pyl.*

Both from Bessels Bay, the first rather fragmentary.

Dr. Moss and Captain Feilden sent fragments of stems from the mud of a raised beach on "Shell-Flat," 200 feet above the present level of the sea, at Floeberg Beach, N. lat. 82° 27′, 61° 22′ W.; these seem to belong to one or both of the species of *Laminaria* above mentioned. Captain Feilden remarks that they retained the peculiar marine smell as strongly as recent specimens. The beds from which the stems were taken are exposed, by the action of a stream, to a depth of not less than 30 feet in thickness. Along with them were found shells of *Mya truncata*, *Astarte borealis*, &c.

DICTYOTACEÆ.

DICTYOSIPHON FŒNICULACEUS, *Grev.*

Rawlings Bay, 80° 20′ N.

The specimens of very slender habit and not in fruit. It has been found also at Disco Island.

CHORDARIACEÆ.

CHORDARIA FLAGELLIFORMIS, *Ag.*

The specimens very dwarf, of slender habit, and very fragmentary. Discovery Bay, 20 fathoms, August 1876.

ECTOCARPACEÆ.

ECTOCARPUS SILICULOSUS, *Lyngb.*

The specimens make a near approach to *E. viridis*, Harv., described in 'Nereis Boreali-Americana,' respecting which the author of that work remarks, "I fear this is too near *E. siliculosus.*"

From Bessels Bay, 7½ fathoms, August 24th, 1875. The specimens were richly incrusted with Diatoms, to be noticed afterwards.

CHÆTOPTERIS PLUMOSA, *Lyngb.*

Cast up on Floeberg Beach, 82° 27′ N., July 1876.

ULVACEÆ.

ULVA LATISSIMA, *L.*

Fragments from 10½ fathoms, 30th June, 1876, 82° 27′ N.; also high-water margin at Mushroom Point, 82° 28′ N.

ENTEROMORPHA CLATHRATA, *Grev.*

Hayes Sound, Buchanan Strait, 79° N., and Port Sheridan, 82° 27′ N.

PRASIOLA SAUTERI, *Menegh.*

Prevoost Island near Cape Sabine, about 78° 40′ N. I had previously seen specimens from marshy spots at Disco.

CONFERVACEÆ.

CHÆTOMORPHA MELAGONIUM, *Web. & Mohr.*

Discovery Bay.

ZYGNEMACEÆ.

ZYGOGONIUM AGARDHII, *Rabh.*, var. NIGRICANS.

Pools on the land, Discovery Bay.

Desmidieæ.

Closterium lunula, *Müller.*

In a stream of fresh water, Discovery Bay.

Rivulariaceæ.

Zonotrichia, sp.

Probably near *Z. fluviatilis*, Ktz. I have only seen a drawing of this by Dr. Moss, who describes it as "forming firm gelatinous bosses on pebbles in running water, the close pointed tubes of brownish endochrome branch, and, passing out through a mucous mass, end in tapering colourless tubules." In streams from a lake, winter-quarters, 82° 27′ N., 61° 22′ W.

Oscillariaceæ.

Oscillaria tenuis, *Ag.*, var. sordida, *Ktz.*

Certainly nearly allied, if not distinct. Fresh water, 82° 27′ N.

Hypheothrix coriacea, *Ktz.*

Walrus Island, 79° 15′ N.

H. vulpina, *Ktz.*

Marshy spots on land, 82° 27′ N.

H. obscura, n. sp.?

Strato pallido, cæspitoso, trichomatibus undulatis, vaginis hyalinis diam. =·0004, articulis obscuris vel obsoletis.

Dried-up pool, Distant Cape, Discovery Bay.

Chthonoblastus, sp.

A few fragments among *Nostoc*, on shores of Discovery Bay. The filaments dull green, =·0002 inch in diameter, about twelve in one sheath, the latter =·006 of an inch.

Tolypothrix glacialis, n. sp.?

Cæspitosa, sordide fuscescens, trichomatibus rigidis, obscure articulatis, vaginis sublamellosis, diam. =·0006.

Forming a brownish crust on decayed *Nostoc*. Edge of Glacier-lake, Cape Baird, at 300 feet, 81° 30′ N.

Nostochineæ.

Nostoc commune, *Vaucher.*

In several localities and in various stages. Prevoost Island,

78° 35′ N.; shores of Hayes Sound, 79° N.; Floeberg Beach, 82° 27′ N.; Egerton Valley, 82° 40′ N. From sea-level up to 1000 feet.

Nostoc aureum, *Ktz.*

Among mud from Floeberg, 82° 27′ N. This was observed by Dr. Moss, from whom I received specimens; it must have been conveyed by currents from the land, or blown off shore with dust from a dried-up pool.

Hormosiphon arcticum, *Berk.*

Near Cape Sabine, about 78 35′, and at 82° 27′ N.

Palmellaceæ.

Hormospora, sp.

Fragments only, too imperfect for recognition. In a ravine at Port Sheridan, 82° 27′ N.

Chroococcus turgidus, *Ktz.* ?

Closely allied, if not identical. Among *Nostoc*, shores of Discovery Bay.

Anacystis, sp.

In a pool at the ice-foot, Distant Cape, Discovery Bay.

Glœocapsa magma, *Ktz.*

Marshes, Floeberg Beach, 82° 27′ N. The species has been found at Disco.

Diatomaceæ.

Subjoined numbers 1 to 29 are the localities whence the Diatomaceæ were obtained; and to some brief remarks are appended. Then follows in alphabetical order a list of the genera and species obtained. To each species are added numbers corresponding to the various localities where collected. Thus it will be seen certain species and genera are of much more frequent occurrence than others, a few being got only in one restricted spot.

1. Near Cape Sabine, 78° 40′ N. lat. From dry bed of a stream, along with fragments of *Enteromorpha clathrata*, the water probably brackish.
2. Floe-ice, 78° 44′ N.
3. Green water, Smith's Sound, 78 to 79° N. lat.
4. Smith's Sound, 78° 57′ N. Temperature +28° Fahr. Depth 210 fathoms.

5. Hayes Sound, 79° 45′ N., 120 fathoms.

6. Off Victoria Head, about 79° 20′ N. lat.

7. Near Cape Prescott, 79° 25′ N.

8. Franklin-Pierce Bay, 79° 25′ N. lat.; 15 and 46 fathoms.

9. Dobbin's Bay, 79° 40′ N. Stated by Captain Feilden to resemble pieces of white fat in the water. August 12th, 1875.

10. Cape John Barrow, 79° 45′ N. Frozen in ice.

11. Near Cape Fraser, 79° 45′ N.

12. Kennedy Channel, 80° to 81° N. Surface-water, temperature 2°·6 Fahr.

13. Bessels Bay*, 81° 7′ N.

14. Discovery Bay, 81° 41′ N., 10 to 20 fathoms.

15. Distant Cape, Discovery Bay. *Melosira nummuloides*, Lyngb., obtained in the ice-foot about ten yards from the shore; abundant and pure, *i. e.* no other Diatoms mixed with it.

16. In a stream of fresh water in Discovery Bay.

17. Among *Nostoc*, wet places, shores of Discovery Bay.

18. Robeson Channel, about 82° N.; obtained among dust from the ice.

19. Floe-berg, Lincoln Bay, 82° 5′ N.

20. The 'Alert's' winter-quarters, 82° 27′ N., from six fathoms, temperature 28°·3 Fahr. *Triceratium arcticum*, Brightw., and *Pleurosigma longum*, Cl., were here observed by Dr. Moss quite fresh and living.

21. In same locality (82° 27′ N.), in a dust band 45 feet from the surface of the Floeberg.

22. Same locality, in mud in round pellets "Oolite-like" from the Floeberg. Here *Navicula* and *Nostoc* conveyed by some means from marshes on the land.

23. Same locality, in a stream from a lake.

24. Floeberg Beach, 82° 27′ N., upon *Chætopteris plumosa.*

25. High-water margin, Mushroom Point, Grinnel Land, 82° 28′ N.

26. Floeberg, Simmond's Island, 82° 35′ N.

27. Egerton Valley, 82° 40′ N. Freshwater species among *Nostoc.*

28. Ice-hummocks and coloured ice, 83° 1′ N. (Capt. Markham).

* A few of the species obtained from this locality were observed by two of our local Diatomists, the Rev. G. Davidson and Mr. Leys.

29. From seventy-two fathoms at 83° 19′ N. lat., by Capt. Markham: *Coscinodiscus excentricus*, Ehrb., and *C. subtilis*, Bail.

List of Genera and Species of Diatoms.

Achnanthes brevipes, *Ag.*, 1, 7.
—— longipes.
Achnanthidium arcticum, *Cl.*, 11, 25.
—— grœnlandicum, *Cl.*, 8, 13, 14, 18, 19.
Amphiprora longa, *Cl.*, 8, 14, 25.
—— Nitzschioides, *Cleve*, 2, 5, 21, 26, 28.
Amphora affinis.
—— Eunotia, *Cleve*, 2,5,7,8, 24, 25.
—— lanceolata, *Cl.*, 26, 28.
—— Leighsmithiana, *O'Meara*, 13.
Biddulphia aurita, *Lyngb.*, 6, 11, 13, 14, 19, 25.
Chætoceros borealis, *Bayl.*, 3.
—— decipiens, *Cl.*, 3.
Cocconeis arctica, *Cl.*, 8.
—— costata, *Greg.*, 13, 14.
—— glacialis, *Cl.*, 25, 28.
—— scutellum, 7, 13, 14, 24.
Coscinodiscus centralis, *Ehb.*, 7, 11, 25, 28.
—— excentricus, *Ehb.*, 5, 8, 9, 12, 14, 19, 20, 26, 28, 29.
—— radiatus, *Ehb.*, 4, 5, 7, 8, 9, 10, 13, 14, 18, 19, 28.
—— subtilis, *Ehb.*, 5, 9, 12, 13, 20, 22, 28, 29.
Cymbella maculata, *Ktz.*, 17, 27.
Denticula frigida, *Ktz.*, 17.
Diatoma elongatum, *Ag.*, 1.
Eunotia arcus, *Sm.*, 1, 16, 17, 23, 27.
—— diodon, *Ehb.*, 27.
Fragilaria oceanica, *Cl.*, 6, 12, 28.
—— striatula, *Lyngb.*, 3, 6, 9, 12, 26.
Grammatophora arctica, *Cl.*, 5, 7, 8, 9, 11, 13, 28.
—— islandica, *Ehb.*, 14.
Melosira nummuloides, *Lyngb.*, 5, 10, 12, 13, 14, 15.
Meridion circulare, *Ag.*, 16.
Navicula ambigua, *Ehb.*, 17.
—— arctica, *Cl.*, 13, 25.
—— borealis, *Ehb.*, 16, 17.
—— cryptocephala, *Ktz.*, 16, 17, 22, 23.
—— didyma, *Ehb.*, 4, 5, 8, 14, 25, 26.
—— directa, *Sm.*, 14.
—— firma.
—— fortis, *Greg.*, 10, 14.
—— globiceps, *Greg.*, 16.
—— liber, *Sm.*, 7, 28.
—— mesolepta, *Ehb.*, 17.
—— minutula, *Sm.*, 27.
—— rhynococephala, *Ktz.*, 1.
—— Smithii, *Bréb.*, 6, 8, 9, 11, 14, 19, 11, 25, 26, 28.
—— subsalina, *Donkin*, 2, 7, 9, 10, 14, 21, 26, 28.
Nitzschia angularis, *Sm.*, 7, 11, 26, 28.
—— closterium, *Ehb.*, 2, 6, 26, 28.
—— sigma, *Ktz.*, 5, 10.
Orthosira marina, *Sm.*, 14, 19, 25, 28.
Pleurosigma angulare.
—— longum, *Cleve*, 2, 9, 10, 12, 13, 14, 20, 28.
Podosira hormoides, *Ktz.*, 13, 11.
Podosphenia gracilis, *Ehb.*, 13.
Raphoneis Quarnerensis, *Grun.*, 5, 8, 25.
Rhabdonema arcuatum, *Ktz.*, 13, 19.
—— Torelli, *Cl.*, 13, 14, 24.
Rhoicosphenia curvata, *Ktz.*, 14, 26.
Stauroneis anceps, *Ehb.*, 27.
—— aspera, *Ehb.*, 11.
—— pulchella, *Sm.*, 7.
Surirella constricta.
—— ovata, *Ktz.*, 19.
—— subsala, *Sm.*, 1.

Synedra fulgens, *Grev.*, 2, 11, 14, 28.
—— kamtschatica, *Grun.*, 13.
—— superba, *Sm.*, 7, 11, 12, 28.
—— tabulata, *Ktz.*, 5, 25, 26.
Thalassiosira Nordenskioldii, *Cl.*, 2, 8, 9, 10, 11, 12, 13, 14, 28.
Triceratium arcticum, *Brightw.*, 8, 11, 12, 13, 14, 20, 28.
Tryblionella marginata, *Sm.*, 13, 14.

Summary.

The seven species of the higher types, enumerated first, all belong to the Olive-coloured series, and, with the exception of the two species of *Laminaria*, are well-known European forms; I could not find any trace of a marine species belonging to the Red series.

The most complete list of Arctic Algæ in a high northern latitude is that of Spitzbergen, given by Professor J. G. Agardh, comprehending 17 Olive and 20 Red; the sea in that quarter is rich in species compared with the localities visited during the late Expedition. The three marine Algæ of the Green series have a very wide distribution in European and other seas; and, with one exception, the marine Algæ noticed here occur also in the Spitzbergen sea. Of freshwater species there are representatives of 14 genera; and most of them are also found in various parts of Europe. The Diatomaceæ represent 31 genera, and amount to 70 species so far as observed by me; most of them are marine, the freshwater species being few in number. The presence of these minute organisms, with their exquisitely sculptured siliceous investments, is a point of much interest in relation to the presence of certain forms of animal life. I have repeatedly received masses of such, resembling pieces of fat or of sodden bread, from ice-floes in various parts of the Arctic sea; and in the alimentary canal of bivalve Mollusca from the same quarter preserved in spirits, I have found abundance of marine Diatoms.

Where these occur (and they are generally plentiful), this implies the possible presence of animal life, the lower forms of which are preyed upon by the higher; and thus we have a very notable and interesting chain of dependence. It is not, therefore, a matter for surprise that 16 species of Bivalves were collected beyond 80° N. by the naturalists of the Expedition.

P. T. Cleve, in a communication to the Swedish Academy of Sciences in 1873, states that the entire number of Diatoms found in the Arctic sea is 181; the species already enumerated, excluding the 12 freshwater, amount to about one third. From the same paper it would appear that those found near Spitzbergen are far more numerous than those now recorded.

Enumeration of the Fungi collected during the Arctic Expedition, 1875–76. By the Rev. M. J. Berkeley, M.A., F.L.S.

[Read March 7, 1878.]

The collection consists of 26 species, of which I have been able with tolerable certainty to determine all but two. At least I have indicated the closest affinities in one or two cases which were difficult from the condition of the specimens, if there is some doubt as to the exact species to which they are referred. Of the 26 species 17 are widely distributed, and 7 hitherto undescribed, besides the two which I have been unable to determine. Of the new species, two at least are very interesting, *Agaricus Feildeni* and *Urnula Hartii.* The former belongs to a group very little understood; and I have therefore to regret that the specimens were so roughly dried (which under the circumstance was unavoidable) that some of the characters are more or less obscure; the latter is a new form of the curious genus *Urnula,* Fr., and so like the figure in 'Flora Danica,' referred by Fries as a variety to *Peziza ciborium*, that I should have thought it the same had not that plant been identified with *Peziza Curreiana.* The occurrence of *Chætomium glabrum* on the walls of the cabin of the 'Alert' in such abundance is very curious. In this country it is widely diffused, not only on papered walls but on bare stone, basket-work, &c.; and it is remarkable that the sporidia are notably smaller in the Arctic specimens. *Agaricus Feildeni,* which occurred several times, is probably esculent, as is certainly the case with *Russula integra.* I ought perhaps to apologize for describing *A. sphærosporus* and *A. Bellotianus* from single specimens; but the characters are such as to separate them from all allied species which had been previously described.

1. Agaricus (Omphalia) umbilicatus, *Schæff.* t. 207; *Fr. Hym. Eur.* p. 155.

On peaty soil. Mount Prospect, Discovery Bay (H. C. Hart). Spores minute, slightly kidney-shaped.

2. A. (Omphalia) umbelliferus, *L.*

On peat. The yellow form. Pnoven, with *Peltigera.* Disco, July 1875. Pnoven, July 1875. Discovery Bay (H. C. Hart). Upernavik, July 22, 1875 (Capt. H. W. Feilden).

Pileus tomentose; stem thickest below, tomentose, about 2 lines high. The specimens are small, but mostly well developed. In those from Discovery Bay the gills are so thickened as to be almost

subglobose. The species is very common in mountainous countries, and is sometimes extremely beautiful.

3. Agaricus (Omphalia) sphærosporus, *B.*

Pileo membranaceo, profunde umbilicato; lamellis latis distantibus, decurrentibus; sporis globosis pedicellatis.

On moss. Upernavik (H. C. Hart). About 1 inch across; spores ·0004 inch in diameter, globose or slightly oval, springing from a very minute pedicel. There is a single specimen only; but the spores are very different from any thing I have met with in manifestly allied species.

4. A. (Clitopilus) undatus, *Fr. Hym. Eur.* p. 199; *Ic.* tab. 96. fig. 4.

Pnoven, July 22, 1875. Cape Sabine, Aug. 1, 1875 (Capt. Feilden).

5. A. (Naucoria) Bellotianus, *B.*

Pileo convexo carnoso; stipite sursum granulato-pulverulento, deorsum incrassato, e massa claviformi oriundo; lamellis argillaceis; sporis majoribus.

Bellot Island, Aug. 14, 1876 (Capt. Feilden). Spores oblique, with a minute pedicel ·0005 inch long, with a large nucleus. The spores in *A. arvalis*, Libert, are ·00032 inch long, the species to which it bears a close affinity.

6. A. (Tubaria) furfuraceus, *P. Syn.* p. 454; *Fr. Hym. Eur.* p. 272.

On moss. Aug. 31, 1875, Upernavik (H. C. Hart). Westward-Ho Valley, lat. 82° 40′ N. (Capt. Feilden). Mount Prospect, 81° 41′ N., winter-quarters, July 4, 1876 (H. C. Hart). In one specimen there is a distinct ring, far more developed than is usual in this very common and variable species.

7. A. (Tubaria) pellucidus, *Bull.* tab. 550. fig. 2; *Fr. Hym. Eur.* p. 273.

Hayes Sound, 79° N. lat., Aug. 4, 1875 (H. C. Hart).

8. A. (Stropharia) Feildeni, *B.*

Pileo crasso pyramidato-rimoso; volva tenui; stipite brevi e massa difformi mycelio percursa oriundo; lamellis nigris; sporis subglobosis hic illic pedicello brevissimo suffultis.

Bellot Island, 81° 41′ N. lat., Aug. 1876 (Capt. Feilden). Mount Prospect, winter-quarters, July 4, 1876 (H. C. Hart).

Pileus convex, 3 inches across when dry, probably much con-

tracted, thick, cracked into large pyramidal warts; stem about ½ inch high, springing from an irregular subglobose mass 1½ inch in diameter, penetrated everywhere with the branched mycelium, the threads of which, where free, bear little young globose pilei; spores brown, nearly globose, ·00025–·0003 in diameter.

This curious species, which at first sight looks like some form of *Agaricus campestris*, though the spores are altogether different, is clearly allied to *Agaricus ocreatus*. The same species apparently was gathered by H. C. Hart at Hayes Sound.

9. HYGROPHORUS VIRGINEUS, *Fr. Hym. Eur.* p. 413.

Small specimens, Sept. 29, 1875, lat. 82° 27′ N. (Capt. Feilden).

10. H. MINIATUS, *Fr. Hym. Eur.* p. 418.

Hayes Sound, Aug. 4, 1875 (H. C. Hart).

11. RUSSULA INTEGRA, *Fr. Hym. Eur.* p. 450.

Bellot Island, lat. 81° 41′ N., Aug. 13, 1876 (Capt. Feilden). Spores yellow. This appears to be one of the commonest species in the north of Europe, and is esculent.

12. CANTHARELLUS MUSCIGENUS, *Fr. Hym. Eur.* p. 460.

On moss. Discovery Bay (H. C. Hart).

13. MERULIUS AURANTIACUS, *Fr. Hym. Eur.* p. 591; *Kl. in Berk. Eng. Fl.* v. p. 128.

Winter-quarters, July 1876 (H. C. Hart). If I am right in the determination of the single specimen, it is curious that it should occur away from Pines, its usual concomitant.

14. LYCOPERDON CRETACEUM, *B.*

Sessile, globoso-depressum, pallide fulvum, scabroso-pulveraceum, sursum cretaceum, in areolas rigidas pyramidatas fissum; capillitio fusco; mycelio repente niveo.

Bellot Island, Aug. 14, 1876 (Capt. Feilden). Threads coarse, irregular; spores ·0002–·0003 in diameter.

15. L. ATROPURPUREUM, *Vitt. Monog. Lyc.* p. 42, tab. ii. fig. 6.

Mount Prospect, winter-quarters, July 4, 1876 (H. C. Hart). Bellot Island, Aug. 13, 1876 (Capt. Feilden). Upernavik, July 22, 1875. Hayes Sound, Aug. 4, 1875 (Capt. Feilden).

Peridium subglobose, plicate at the cellular base, covered at first with minute prickles, which gradually vanish, stellulato-verrucose above, the warts at length deciduous; threads clay-coloured; spores dark, echinulate, ·0002–·0003 in diameter; mycelium white.

I have given a description, because it departs slightly from Vittadini's species, but not sufficiently to justify proposing a new species. It may be considered as var. *arcticum*, distinguished by the warty apex, the plant of Vittadini being uniformly clothed with minute prickles.

There is a species apparently distinct, from Hayes Sound, with clay-coloured spores; but the specimens are too old and broken to be safely diagnosed.

16. TRICHOBASIS PYROLÆ, *B. Outl.*, p. 382.—Uredo Pyrolæ, *Grev. Fl. Ed.* p. 440.

Pnoven, on leaves of *Pyrola*. Just like specimens from Scotland. The spores are not subglobose in any condition of the species, but decidedly obovate, ·0009–·001 inch long, and minutely echinulate.

17. STILBUM ARCTICUM, *B.*

Microscopicum, melleum, hyalinum; stipite cylindrico e floccis rectis apice sporiferis compacto.

On the stem of *Agaricus sphærosporus*, B., Upernavik (H. C. Hart). Spores oblong, truncate at either end, ·00013 inch long.

18. PEZIZA STERCOREA, *P. Obs.* ii. p. 89; *Fr. Syst. Myc.* ii. p. 87; *Cooke, Micr.* fig. 147.

Discovery Bay, July 29, 1876 (H. C. Hart), on dung of Musk-ox. I do not find any stellate or peltate bristles.

19. ASCOBOLUS FURFURACEUS, *P. Obs.* i. t. 4. f. 3–6.

On Musk-ox dung with *Peziza stercorea.*

20. URNULA HARTII, *B.*

Cupula cyathiformi, extus cum stipite spadiceo velutina; margine inflexo; hymenio pallidiore; sporidiis ellipticis binucleatis.

On moss, Upernavik, July 1875 (H. C. Hart). Lat. 82° 29′ N., July 1876 (Capt. Feilden). Cup 3 lines broad, stem 2 lines high; sporidia uniseriate, ·0006 inch long, ·0003 wide.

Clearly allied to *U. craterium*, Fr. (*Cenangium craterium*), which was found in Arctic America by Drummond, though comparatively so diminutive. The sporidia in the original species are at least ·002 inch long. I have, however, one or possibly two distinct species. The habit of *U. Hartii* is exactly that of *Peziza ciborium*, Fl. Dan. t. 1078. f. 1.

21. CHÆTOMIUM GLABRUM, *B. & Br. Ann. Nat. Hist.* May 1873, p. 349, tab. x. fig. 15.

On damp surfaces in cabin, 82° 27′ N. lat. Sporidia globose, ·00032 inch in diameter. In the British plant ·0005; but in other respects the two are identical. "This fungus grew abundantly on damp surfaces in the cabin next to the berth-deck of the 'Alert' during the winter of 1875–76. The atmosphere during the winter was replete with sporules. Some of them must have entered the ship." Some species of *Mucor* seem also occasionally to have accompanied the *Chætomium*.

22. VENTURIA MYRTILLI, *Cooke, Journ. of Bot.* Aug. 1866, tab. 50. fig. 4.

On semiputrid leaves, Discovery Bay (J. C. Hart). Probably the same thing occurred at Pnoven on *Cassiopeia tetragona*.

23. SPHÆRELLA LINEOLATA, *De Not.*—Sphæria lineolata, *Desm. Pl. Crypt.* no. 1263; *Cooke, l. c.* tab. 51. fig. 31.

On grass with the last. The perithecia are scattered; but the leaf is very small. Sporidia at first hyaline, uniseptate, gradually acquiring a brown tinge, at length triseptate, the articulations slightly constricted, ·0013 inch long.

24. DOTHIDEA BULLULATA, *B.*

Discis parvis bullulatis ostiolis punctiformibus notatis, e basi filamentosa oriundis; sporidiis uniseptatis uniserialibus utrinque leviter attenuatis.

On leaves, Disco (H. C. Hart). Sporidia ·0006 inch long, about half as much wide.

Experiments on the Nutrition of *Drosera rotundifolia*.

By FRANCIS DARWIN, M.B., F.L.S.

[Read January 17, 1878.]

THE mass of observation and experiment contained in my father's book on Insectivorous Plants is all brought to bear on the central theory of the book—the belief that the power of catching and digesting insects is advantageous to the plants, and plays an important part in their economy. If this explanation of the facts be not accepted, we find ourselves in the presence of a number of elaborate, but quite meaningless, structures and properties:—structures such as the trap of a *Dionæa* or *Utricularia*; delicate powers of discriminating between different kinds of stimuli, as in *Drosera*; and properties of forming a peptic secretion, such as that

in *Pinguicula, Dionæa, Drosera,* &c. Many observers have acceded to my father's views on this subject; but since he has given no direct proof of advantage accruing to the plant from the capture and digestion of insects, a provisional acceptance of his theory may fairly be followed by a request that such direct proof should be furnished. It was to supply this want that an experiment was set on foot several years ago by my father. Plants of *Drosera* were cultivated in plates, each of which was divided into halves by a strip of zinc plate. The plants on one side of the partition were to have been fed, the other half being kept without food, their growth &c. being compared. Unfortunately both the fed and the starved plants died, either poisoned by the zinc, or injured in some other way: in consequence of this accident the experiment failed.

The experiments here described are of precisely the same nature as those begun by my father; but profiting by his experience, I have used wooden instead of metal partitions.

It may not be without interest to show, by reference to the recent literature of the subject, that the want of some such experiments has been rather widely felt.

E. Morren, of Liège, although he considers* it beyond doubt that the leaves can absorb animal matter from the captured insects, remarks† that it ought to be experimentally established that the absorption really contributes to the nourishment of the plant.

Cramer, of Zurich, goes carefully into the question‡, and points out (p. 33) that many experienced cultivators and naturalists, such as Kurz, Munk, Regel, Schenk, Veitch, and Williams, find that *Dionæa* §, *Nepenthes*, *Sarracenia*, *Cephalotus*, and *Aldrovanda* thrive as well when starved as when supplied with insects. Cramer remarks that the question ought to be experimentally decided.

* 'La Digestion végétale,' 1876.

† 'La Théorie des Plantes carnivores,' Liège, 1876.

‡ 'Insectfressenden Pflanzen,' 1876.

§ I have found it a difficult task to starve *Dionæa*-plants properly. I have at the present time 30 plants growing under a closely-gauzed case. 15 are being starved, the others fed. On looking over the plants I have frequently found woodlice caught by the *starved* leaves. I suppose they got in with the moss used to pack the pots, or in some other way. An unpractised eye would easily mistake a closed leaf containing a small insect for a young unopened leaf.

Munk (as quoted by Cramer) remarks that the catching and driving away of insects may be of service to the plant; but in the digestion he can only see an injury. He suggests that the peculiarity of the digestive process being both pathological and physiological, seems to agree with the fact that in spite of a highly differentiated organism, *Dionæa* appears to be approaching extinction.

Cramer quotes (p. 34) Schenk, who, like Munk, finds it impossible to believe that a digestive process that kills the functioning organ can be serviceable to its possessor. As Cramer remarks, these pathological results are no doubt in some cases the result of overfeeding. Schenk (quoted by Cramer, p. 34) appears to doubt the digestive powers of *Aldrovanda*, because he found it flourish for a long time in Knop's nutritive solution. Cohn* remarks that Schenk's results only prove that the leaves of *Aldrovanda* can absorb nitrogenous (though not animalized) fluids; and he adds that his own experiments prove that these plants do not flourish in pure water with no insects.

Duval Jouve † observes that the fact of digestion causing the death of *Dionæa* (Canby), and the results of Lawson Tait's experiments (Nature, July 29, 1875), make him extremely doubtful as to the process being any advantage to the plant.

Casimir de Candolle ‡ made a comparative experiment on four *Dionæa* plants, two of which were fed and two starved. They were carefully watched for six weeks, and no difference was noticed between the two sets. M. de Candolle concludes that animal food is not necessary to the plants. He is careful to point out that the number of plants experimented on is too few to draw any certain conclusions therefrom.

Göppert § remarks that "the so-called carnivorous plants do not absolutely require animal food for their support, and can well dispense with it."

Ch. Cavallier addressed the question to a number of distinguished observers as to their opinion on the subject of vegetable digestion. A few of the published replies are here given ||.

* Thätigkeit der botan. Section der schles. Gesellsch. für vaterl. Cultur, 1876, p. 113.

† Causerie Botanique, Aug. 1876.

‡ Archives des Sciences phys. et nat. Genève, April 1876, p. 3.

§ Thätigkeit der botan. Section der schles. Gesellsch. 1876, p. 101.

|| Annales de la Soc. d'Horticulture de l'Hérault, March and April 1876, p. 56.

Faivre, of Lyons, points out that the problem is at present rather stated than solved.

Ch. Naudin considers that there is far from being any proof that the substances dissolved by the secretion of the leaves are absorbed or assimilated. He states that digestion is assumed to occur without proof; and it is a matter of doubt whether this proof will ever be obtained.

P. Duchartre finds it impossible to admit that the capture of insects serves directly for the nourishment of the plant, because it is contrary to our present knowledge that leaves should be able to absorb liquids. He points out that no one has demonstrated that animal food supplied to the leaves produces any appreciable effect on the plant.

Parlatore, of Florence, admits that the captured insects are dissolved but not absorbed; he remarks that such absorption has not been proved to take place.

Béchamp, who goes into the question from the point of view of a chemist, considers that "scientifiquement c'est faire un épouvantable cercle vicieux que de supposer des végétaux carnivores." Because animals depend ultimately on vegetables for food, therefore no vegetables can be supported by animals. M. Béchamp concludes: "L'idée de plantes carnivores est donc le produit d'une illusion le renversement des demonstrations les mieux fondées de la science."

The most recent remarks which I have been able to find on this subject are in a highly interesting memoir by W. Pfeffer, of Basel*. He considers it to be doubful whether the capture of insects is any definite advantage to the plants in a state of nature. He remarks that he has himself observed the thriving growth from winter-buds of *Drosera*-plants to which no animal food is given.

In the periodical above quoted (p. 112) are some valuable remarks by Cohn. He points out that insectivorous plants are often cultivated in rich soil, whereas in nature they grow in poor peaty land. Therefore under culture they obtain the nitrogen by their roots, for which in a state of nature they depend on their leaves. Pfeffer, *loc. cit.* p. 988, insists that the smallness of the roots of many insect-catching plants is not a fair argument in favour of the view that the chief nitrogenous supply comes from

* Landwirthschaftliche Jahrbücher, 1877, p. 986.

the leaves, because many ordinary marsh-plants have equally small roots. Cohn concludes that the fact of *Dionæa*, *Sarracenia*, or *Nepenthes* thriving under culture when deprived of animal food is in no way contradictory to the belief that the leaves can digest nitrogenous materials.

My experiments were conducted in the following manner. The *Drosera* plants were obtained from a neighbouring common on June 11, 1877, and were planted in moss in six ordinary soup-plates. The plates were placed in two rows on a wood tray having a raised border all round, and were covered by a wooden frame 1 foot (about 30 centims.) in height, over which gauze netting (with a mesh of 1·4 millim. diameter) was stretched. This gauze was similar to that used by my father in his crossing experiments, and known to be effective in excluding insects. The frame lifted off and on like a bell-glass, and fitted close within the rim of the tray. Hardly any insects penetrated into the case; but I did not particularly attend to this point, because any insects caught by the starved plants could only render my results less striking, but could introduce no error. The whole apparatus stood near the light in a grape-house where no artificial heat was applied. The shade produced by the vine-branches and by the gauze, appeared to suit the plants, as they throve wonderfully. The plants and the moss in which they grew were kept very moist; and by frequently pouring out the water in the plates and adding a fresh supply, the water was constantly renewed.

Owing to a delay in beginning the experiment, the plants were well grown when collected. The results might have been more striking if the experiment could have been commenced with younger plants; but as it was, I had at least the advantage of knowing that the plants were perfectly healthy. Each plate was divided by eye into two halves separated from each other by a thin piece of wood hardly reaching above the surface of the moss. That half of each plate which appeared *least* flourishing was selected to be the "fed" side, the opposite side being labelled "starved" *. The plants grew so close together that it was difficult to count them accurately; but the following Table gives the numbers as counted roughly.

* For the sake of clearness in my notes &c., I used the word "starved" in place of the more correct "unfed."

TABLE I.

Distinguishing label on plate.	Number of plants. Starved.	Fed.
I.	16	14
II.	12	13
III.	19	14
IV.	17	13
V.	13	15
VI.	14	17
Total	91	86

The number of plants on the fed side could not have differed from that on the starved side materially; for on Sept. 3 the contents of three of plates (I., III., and VI.) were floated in water and the plants carefully picked out and counted, and the starved plants were 82, the fed 84 in number, including a number of minute dwarf-like offsets.

The plants were arranged with the partition-line of each pointing to the light, so that neither side received more light than the other; and the arrangement of the plates was systematically varied, so as to prevent any one profiting from light or air more than its fellows. The plates were placed under the net on June 12th, and the leaves fed on that and the following day. Owing to my absence, they were not again fed till July 5th, after which date the following Table gives the days of feeding.

TABLE II.

Days on which plates I., II., and III. were fed.	Days on which plates IV., V., and VI. were fed.
July 9	July 13
" 14	" 18
" 22	" 21
" 25	" 27
" 31	Aug. 3
Aug. 4	" 13
" 17	" 25
" 25	

II., IV., and V. were fed Aug. 8; I., III., and VI. Aug. 9.

The feeding was carried out as follows:—Roast meat was cut into thin slices across the grain, and the fibre teazed and cut into fragments so minute that fifteen weighed, when damp, only 2 centigrams: each is therefore 1·3 milligram, or $\frac{1}{50}$ grain; and sometimes smaller pieces were used. These small pieces of meat were, on the fed side of the plates, placed on every leaf which had secretion on the glands. I found it best to place two or three of the smallest pieces each on a separate tentacle. On several occasions I attempted to increase the size of the morsels, but was forced to return to the smaller size on finding the meat covered with mould instead of being digested. When such mouldy leaves were noticed, they were usually removed, lest the meat should be washed off and putrefy among the roots of the plants, thus vitiating the experiments. In the tedious process of feeding a number of plants I occasionally dropped a morsel of meat among the moss; the infinitesimal error arising from these accidents would be counteracted by the frequent renewal of the water in the plates.

The first difference noticed between the fed and starved halves of the plates was on July 17th, when the fed side, viewed as a whole, was clearly greener than the starved half. The difference was quite distinct in all six plates, as both my father and myself observed. The tentacles on the starved side were also of a redder colour than those of the fed plants.

The increase in the amount of chlorophyll in the fed plants thus indicated is an interesting fact; and it agrees with the result of the final comparison of dry weights, which proves that a much greater quantity of cellulose is manufactured by the fed than by the starved plants. An increase of chlorophyll is associated with an increased assimilation of carbonic acid; and this permits the production of a larger quantity of cellulose. An average leaf from the fed and from the starved side were examined on July 18th*, when the difference was most marked, the fed leaves being clearly distinguishable outwardly by their dark purple hue, and microscopically by large and numerous chlorophyll grains crowded with starch.

Unfortunately no more leaves were examined at this date.

* The chlorophyll was removed by alcohol, and the sections then treated with dilute acetic acid, washed, treated with iodine solution, washed again, and mounted in glycerine.

When, on Aug. 16, 17 and 21, leaves were examined in the same way, they did not show any striking difference in the amount of starch. This may be accounted for by migration of starch to the root-stocks and flower-stems having begun. Since, however, the starch represents the surplus of assimilated matter which has not been converted into cellulose, is it not possible that in spite of great activity of the chlorophyll-function there might be no accumulation of starch because of great formation of cellulose? The final results of the experiment prove conclusively that far more carbohydrates were formed by the fed plants; therefore it is almost certain that the first results obtained (July 18th) represent the true state of the case. The body of the chlorophyll grain being protoplasmic, it is obvious that an increased supply of nitrogen will favour the multiplication of chlorophyll and increase the starch-producing power of the plant. Hence the well-known effect of manure in increasing the yield of starch in many seeds, roots, &c. Fraustadt* states that the starch in *Dionæa* "diminishes with absorption of organic matter by the leaves." This result may be perhaps attributed to over-feeding.

The following Table shows that absorption of nitrogenous food had by Aug. 7 produced a most decided effect.

TABLE III.

Number of Flower-stems on each side in the six plates (Aug. 7).

Plate.	Starved.	Fed.
I.	16	22
II.	17	28
III.	26	32
IV.	19	25
V.	20	30
VI.	18	36
Total	116	173

or in the proportion of 100 : 149·1.

It will be seen that in every plate there are more flower-stems on the fed side. The above stems bore mostly ripening capsules; but as the fed plants seemed to have more actual flower-bearing stems, the following Table was made on August 8.

* 'Anatomie der vegetativen Organe von *Dionæa muscipula*,' Inaugural Dissertation, Breslau, 1876, p. 33.

TABLE IV.

Number of Stems which bear at least one flower (Aug. 8).

Plate.	Starved.	Fed.
I.	0	5
II.	2	10
III.	7	1
IV.	4	7
V.	4	4
VI.	2	7
Total	19	34

or in the proportion of 100 : 178·9.

Here the difference does not run quite uniformly through the six plates.

The following Table gives the number of healthy leaves on the starved and fed sides of three of the six plates. The healthiness was determined by the presence of secretion on the glands. As it was impossible to disturb the plants, this counting could not be very accurate.

TABLE V.

Number of Healthy Leaves.

Plate.	Starved.	Fed.
IV.	48	67
V.	78	92
VI.	61	97
Total	187	256

Or as 100 : 136·9.

At the same time * the diameter of 45 fed and 45 starved leaves taken at random were measured. As the leaves could not be removed, the measurements were rough; the diameters, exclusive of tentacles, were taken with a pair of compasses and pricked along a line, which was afterwards measured with a millimetre-scale. Forty-five starved leaves gave a total of 301 millims., the corresponding total for 45 fed leaves being 328 millims.; the proportion between the average diameters is therefore 100 : 108·9.

On Aug. 8th the flower-stems of the fed plants were noticed to be clearly redder than those of the starved plants. This fact

* The dates of these observations and of those in Table V. were omitted. They were all made about the middle of August.

tallies with an unrecorded impression that the fed flower-stems were previously much greener than the starved plants.

At the end of August the capsules were mostly ripe; and as there was the danger of loss of seeds by the bursting of capsules, the flower-stems from all six plates were cut on August 31 and September 1st. Thirty capsules were taken by chance from the fed and the same number from the starved stems. When dry, the capsules were opened and their seeds carefully counted under a dissecting-microscope. The stems were set aside to dry, and were then measured, weighed, &c., as shown in the following Tables.

Table VI.

A.		B.	
The numbers, heights, and weights of the starved and fed plants.		Proportion between the numbers in the starved and fed columns of A; "starved" being taken =100.	
Number of plants in plates I., III., and VI., *roughly* counted (June 12th).		Starved.	Fed.
Starved. 49	Fed. 45	100 :	91·6
Number of plants (including minute offsets) accurately counted, Sept. 3rd.			
82	84	100 :	101·2
Total weight of 81 fed and 83 starved plants without flower-stems. Dried at 80°–90° C.			
grm. 1·176	grm. 1·429	100 :	121·5
After gathering and washing the plants, they were preserved in spirit with a view to examining the root-stocks to compare the amount of starch; this was, however, found impracticable. The alcohol which had contained the fed plants was much more discoloured, showing that they contained more chlorophyll. I intended to evaporate the alcohol and add the weight of the residue to the dry weight of the plants. This, however, failed, owing to an accident with the water-bath.			

TABLE VII.

A.		B.		
Total number of stems (including those bearing flowers as well as those bearing capsules) gathered from all the plates.		Proportion between the two columns of A; starved being taken = 100.		
Starved. 117 (including 2 flowers).	Fed. 193 (including 9 flowers).	Starved. 100	:	Fed. 164·9
Sum of the heights of 115 starved and 184 fed stems (excluding flower-bearing stems).				
millims. 16835	millims. 26918	100	:	159·9
Average height of the above 115 starved and 184 fed stems.				
millims. 146·4	millims. 146·3	100	:	99·9
Total weight of 116 starved and 191 fed stems (including both those bearing flowers and those bearing capsules). *				
grm. 1·91	grm. 4·43	100	:	231·9
Average weight per stem.				
grm. ·01646	grm. ·023193	100	:	141·3

Note.—The stems which bore only flowers were not included in the measuring because they were not full-grown; they were included in the weighing because it was not worth while going over the whole set of stems to exclude them.

* The numbers in the first compartment are 117, 193, because 2 plants used for microscopic examination are here counted.

TABLE VIII.

A.		B.	
Total number of capsules borne by 115 starved and 184 fed stems (from all the plates).		Proportion between the two columns of A; starved being taken =100.	
Starved. 756	Fed. 1471	Starved. 100 :	Fed. 194·4
Average number of capsules per stem.			
6·57	7·99	100 :	121·6
Total weight of 30 starved and 30 fed capsules.			
grm. ·10	grm. ·13	100 :	130
Total number of seeds contained by 29 starved and 29 fed capsules.			
2640	3239	100 :	122·7
Average number of seeds per capsule.			
91	111·7	100 :	122·7

Among the starved capsules the minimum number of seeds was 44, maximum 129; the minimum for fed capsules was 52, the maximum 168. One starved capsule contained only 20 seeds, and was therefore not included; one fed capsule was lost; so that the seeds of same number of capsules of each kind were counted.

In calculating the average weight of a seed &c. in the following Table the produce of only 20 fed capsules could be employed, as the counted seeds of 9 fed capsules were thrown away before it occurred to me to weigh them.

It will be seen from the Tables that the difference between the fed and starved plants was investigated in a variety of ways, and that in every particular the fed show a marked

TABLE IX.

A.		B.	
Weight of 2640 starved and 1578 fed seeds.		Proportion between two columns of A; starved being taken = 100.	
Starved. mgrs. 25·5	Fed. mgrs. 24·0	Starved.	Fed.
Average weight of each seed.			
mgr. ·00966	mgr. ·0152	100 :	157·36
Total calculated number of seeds yielded by the plants in all the plates.			
68,040	164,296	100 :	241·5
Total calculated weight of seeds yielded by the plants in all the plates.			
grm. ·6572	grms. 2·4956	100 :	379·7

advantage. It is true that the *average* height of the stems is almost exactly equal (starved : fed : : 100 : 99·9). But if the average height of stem *per plant* had been calculated, it would have been about 100 : 159·9, which is the proportion between the sum of the heights of all the starved and all the fed plants. Another interesting fact is that, although the number and height of the stems and the number of the seeds of the fed plants considerably exceed the corresponding numbers in the "starved" column, yet the *weights* of the stems and the *weights* of the seeds on the fed side exceed the corresponding weights in the starved columns in a still higher ratio. This is important, because increased weight is a better proof than an increase in numbers or size of increased assimilation.

If we compare Table III. with Table VII., we find that on Aug. 7 the starved flower-stems numbered 116, the fed ones 173; on Sept. 1st the starved stems were 117, while the fed ones numbered 193.

Thus the fed plants had in 24 days produced 20 new flower-stems, while the number of the starved ones was only increased by 1. This fact tallies with the results of Tables III. and IV., which show that the fed plants continue to flower longer—about one fifth of the fed stems having flowers, while one sixth only of the starved ones were in the same state.

It will be seen in Table VI. that on comparing the plants from which the flower-stems had been gathered, no very striking difference is found to exist between the fed and the starved plants; while in all that relates to reproduction of the species the difference is most striking, especially when the corresponding *weights* are compared. Thus, taking the weights of the plants without flower-stems, we find the proportion between starved and fed to be 100 : 121·5, whereas the weights of the total amounts of seed produced are in the ratio 100 : 379·7.

It would seem from these results that the great advantage accruing to carnivorous plants from a supply of nitrogenous food to the leaves is the power of producing a vastly superior yield of seeds. This will no doubt partly explain the fact which has been a stumbling-block to many, that insectivorous plants seem to thrive without animal food; although, as I have shown, the fed plants are in reality markedly superior in general appearance. I venture to think that the above experiments prove beyond question that the supply of meat to *Drosera* is of signal advantage to the plants. There can be no doubt that both *Drosera* and other insectivorous plants profit in an analogous manner from the capture of insects in a state of nature.

In conclusion, I may mention that there are three plates of *Drosera* of which the flower-stalks only were gathered, and which are allowed to rest during the winter. It will be very interesting to observe the relative numbers and size of the plants which spring up on the fed and starved sides of the partitions. As the plants are now being forced in the hothouse, I shall probably be able to add an Appendix to the present paper stating their results.

Appendix*. April 5th, 1878.

As above stated, three plates were (after the removal of the flower-stalks) allowed to rest during the winter in order to test the relative amounts of reserve material laid up by the starved

* See also an additional memorandum *posteà*.

and fed plants. The plates were placed in the hothouse; and by the middle of January, when the fresh leaves began to appear, it was evident that more plants were springing up on the fed side of the partition. The plates were then covered with the gauze netting, and both sets of plants remained without food in the hothouse.

On April 3rd all the plants were carefully picked out from the moss and thoroughly cleansed from adhering fragments; they were then counted, dried in a water-bath, and weighed. The fed and starved plants*, when freshly gathered and before being dried, were pressed together each into a separate handful; the far greater mass of fed plants was very evidently seen in this way. During the processes of counting and cleansing the plants, I was struck by the fact that the fed plants had a decidedly greater amount of rootstock.

The following Table gives the results of counting and weighing the plants.

TABLE X.

	Actual numbers and weights.		Proportion between starved and fed.	
	Starved.	Fed.	Starved.	Fed.
Number of plants	89	105	100	118·0
	grm.	grm.		
Total weight	·206	·518	100	251·6
Average weight per plant ...	·0023	·0049	100	213·0

It will be seen that there is only a small difference (18 per cent.) between the *number* of starved and fed plants; a large number of very minute offsets were found on both sides, and were all counted as separate plants. Judging either by the total weight of plants produced or by the average weight per plant, there can be no doubt of the great advantage accruing to the fed plants. It is a striking fact that in spite of the relatively enormous quantity of flower-stalk and seed produced in the summer by the fed plants, they were still able to lay by a far greater store of reserve material than their starved competitors.

Finally, it may be pointed out that this advantage of the fed *Drosera* plants is one which would escape the notice of a casual observer.

* That is, the plants which sprang from the fed and starved sides of the partition.

Additional Memorandum concerning the Nutrition of *Drosera rotundifolia.* By FRANCIS DARWIN, M.B., F.L.S.

SINCE the reading of my paper on this subject before the Society, and while it was passing through the press (*ante*, pp. 17–31), I have become acquainted with an important article on the same subject, of which it behoves me to take notice. I allude to the interesting researches of Messrs. Reess, Kellermann, and von Raumer ('Vegetation—versuche an *Drosera rotundifolia* mit und ohne Fleischfutterung,' ausgeführt von Dr. Ch. Kellermann und Dr. E. von Raumer mitgetheilt von M. Reess. 'Botan. Zeitung,' April 5th, 1878), which were originally described before the Phys.-Med. Society of Erlangen, July 9, 1877. The experiments were essentially similar to my own, and consisted in the varied and detailed comparison of a large number of *fed* and *unfed* plants of *Drosera.* The food-supply consisted of Aphides instead of meat as in my experiments; and this, as being more natural, is probably a better method than the one adopted by me.

The work seems to have been done with great care; and the results demonstrate in the clearest manner the numerous and striking advantages accruing to the *fed* plants.—F. D., May 6, 1878.

Observations on the Genus *Pandanus* (Screw-Pines); with an Enumeration of all Species described or named in Books, Herbaria, and Nurserymen's Catalogues; together with their Synonyms and Native Countries as far as these have been ascertained. By Dr. ISAAC BAYLEY BALFOUR, F.L.S., F.R.S.E., &c.

[Read December 6, 1877.]

FEW families of plants present more difficulty in their elucidation than the Pandanaceæ. This arises from a threefold cause:—in the first place, from the variability of the species, dependent not only on relative position with reference to climatic influences, but also on the age of the individuals. Secondly, we find it is by no means easy to obtain characters sufficiently diagnostic, as the leaves afford marks of little or no value; and hitherto it has been from the fruit that distinctions have been drawn. The flowers of the male tree yield in some instances good characters; but we have as yet received flowers of only a few species, and these in some cases without information sufficient for identification with the female. Lastly, in dealing with primitive types of such variability, it is necessary to obtain a long series of specimens ere we can determine with certainty the limits of species; and these, I regret to say, are still in great measure wanting. The difficulty regarding specimens is still further increased by the fact that the fruits lose much of their character in drying. It is therefore almost impossible to investigate the group without some experience of the plants in their native haunts, where, by a consideration of the combination of characters derived from habit, foliage, flower, and fruit, a correct estimate may be formed.

Having had opportunities of studying the group as represented in the Mascarene Islands, and having already described* some species from these islands and from the Seychelles Islands, I have been tempted to enter on a large undertaking, and to contemplate a monograph of the whole Order. With this view I now venture to lay before the Society a synopsis of the species of the genus *Pandanus*, so far as I have been able to determine them. I am quite conscious that, as it now stands, the list is a very imperfect one, and there are numerous errors. It can hardly be otherwise, founded, as it is, so greatly on mere descriptions usually very unsatisfactory. But I am advised to bring it forward in its present form, with the hope that any persons

* Baker's 'Flora of Mauritius and Seychelles,' p. 395.

into whose hands it may fall, and who may be so situated as to have an opportunity of supplying information or material will not neglect it, and will thus forward the completion of the monograph. To render the list more serviceable, I have appended, in addition to the synonyms and references, all the popular names; and the locality is also given for each species. And, further, at the end of the list will be found a short note with directions as to the most suitable modes of preserving specimens of the fruits of *Pandanus*.

I do not intend at present to say any thing about the affinities of the Pandanaceæ, whether regarded as a family *per se*, or as a tribe of a large group; but it may not be out of place to say a few words concerning the genus *Pandanus* itself, as a prelude to the list of species.

Before the time of Linnæus the Screw-pines had attracted the attention of many voyagers and botanists; and we find frequent references to them in the older works, but under designations and with descriptions which render it difficult to recognize them. The earliest reference to the plants I have seen is in 'Tractado de las Drogas' of Christopher Acosta, published in 1578. On page 347 of this book, we find a description of a species under the designation *Ananas Bravo*; and there is a figure, very rude, but undoubtedly intended to represent a Screw-pine. John Bauhin, in 'Historia Plantarum' p. 96, describes the same species, copying the figure, but alters the name to *Ananas sylvestris*, and gives as a synonym the *Keura* of the Arabians. We have references to the same plant, usually under the name of *Ananas* or *Carduus*, in the works of the various botanists who wrote towards the end of the seventeenth and commencement of the eighteenth century; and in 1748 Linnæus indicates the plant, in his 'Flora Zeylanica,' as *Bromelia sylvestris*. In the fourth volume of the 'Herbarium Amboinense,' Rumphius in 1750 published an account, with figures, of thirteen kinds of *Pandang* or *Pandanus* from the Indian Archipelago; and it is to him we owe the name of *Pandanus*. His descriptions are excedingly bad, and the figures so poor—in striking contrast with those given by Reede in the second volume of the 'Hortus Malabaricus' nearly a century before—that any identification therefrom is little more than a guess, though perhaps some light may be thrown on them by means of the local names, and a study of the species on the spot. In this state of confusion Linnæus omitted the genus from his system; and it is only in the

Supplement of the younger Linnæus that we find the genus *Pandanus* established as including one species, *P. odoratissimus*, but so briefly described that, were it not for the references, we should have some difficulty in identifying it.

The genus so constituted increased in species, until at present nearly sixty true species are known. With the increase of species came attempts to break up the genus. Forster and Forskål had, shortly after the publication of the younger Linnæus's Supplement, described the species he indicated under the generic names respectively of *Arthrodactylis* and *Keura*; and these naturally enough now fall into *Pandanus*. An attempt was made by Hasskarl to found a new genus *Marquartia*, renamed *Hasskarlia* by Walpers, but on no sufficient ground. But it remained for Gaudichaud to carry the multiplication of genera to an extreme. In the Atlas of the Botany of the 'Voyage de la Bonite,' to which unfortunately no text was published, are figured fruits of various species of *Pandanus* under no less than thirteen different genera. Having seen in the Museum of Paris type specimens of nearly the whole of these, I have no hesitation in referring them all to the one genus *Pandanus*. In this way disappear the following genera:—*Barrotia*, *Bryantia*, *Dorystigma*, *Eydouxia*, *Fisquetia*, *Fouillioya*, *Heterostigma*, *Hombronia*, *Jeanneretia*, *Roussinia*, *Sussea*, *Tuckeya*, and *Vinsonia*. Many of Gaudichaud's species are identical with forms known before his time; but these are indicated in the list which follows, and need not be further noticed here.

Later De Vriese created two new genera, *Doornia* and *Ryckia*, which must share the fate of the others. *Doornia* includes a species which is said to be probably Mascarene, but which I do not know, unless it be *Pandanus conglomeratus*, Balf. fil., though the description does not quite suit. The well-known *Pandanus furcatus* is the species on which *Ryckia* was founded.

Most recently, Brongniart, in working up the species of Pandaneæ from New Caledonia, has determined to keep up the genera *Barrotia* and *Bryantia* of Gaudichaud; and in these he puts many species from New Caledonia. I have seen his specimens, and I do not consider there is any need for so doing. Indeed Brongniart rests his determination in great part on the structure of the male flowers, whilst, so far as the plates in the Atlas of the 'Voyage de la Bonite' and the specimens in the Museum at Paris go, there is nothing to show that Gaudichaud knew aught of the male flowers

of the plants he put in these genera. Certainly the male flowers of *Barrotia diodon*, Gaud. (*Pandanus furcatus*, Roxb.), do not correspond with the type described by Brongniart. Brongniart seems to have had some misgivings about putting his New-Caledonian species under the genus *Bryantia*, and constitutes a subgenus *Lophostigma* to include them.

I have no doubt, then, that all those genera I have mentioned may be referred back again to the one genus *Pandanus*, the definition of which, however, must be considerably altered from that commonly given.

The genus contains, as I have said, a number of species which are distributed throughout the tropics of the Old World. Some few species, however, do extend beyond tropical boundaries. The genus runs through a great extent of longitude. A few species are found on the east coast of Africa; and thence it stretches eastward through the Mascarene Islands, India, and the Indian archipelago and Australia, until its eastern limit is reached about the Sandwich Islands. In fact, the species are found more or less between 30° N. and 30° S. latitude, and 158° E. and 18° W. longitude. Throughout this range there seem to be two areas of distribution, one with its centre in the Mascarene Islands, and the other in the Eastern archipelago; and the species of each area do not commingle. It is worth while mentioning, as I have not seen it noticed elsewhere, that it is a common feature of the species of the Mascarene area to have red spines on their leaves, though this is not the case in all; whilst in the species from the Eastern area, so far as I know them, those with red spines on the leaves are the exception. Further, I may notice that in no species of the Mascarene area with red spines have I found the spines on the leaf-edges or midrib recurved; whilst in the white-spined species of the Eastern area this recurvation is common.

Regarding the species, the nomenclature is at present in a state of great confusion. This is due in great part to difficulties of identification, but also greatly to the multiplication of names resorted to by horticulturists; and another great source of confusion has been introduced in the retention by recent writers on the group of some ante-Linnean names. In the following list I have given all the names of species I have been able to find, quoting the authority and giving a reference to where it may be found. Of many I know nothing save the name; and it may be taken for granted that a great number have no claim to be species;

but I have thought it advisable to follow the plan of giving all the names at present when seeking for information. All ante-Linnean names are discarded, according to the custom adopted in Britain. In giving the popular names the authority for each is quoted where more than one author has given a name, and, as far as possible, the exact locality is mentioned.

Note on the Preservation of Pandanus-*fruits.*

To preserve the fruit of *Pandanus* it is best to place the whole head in spirit, having previously enveloped it in canvas-netting or other material, which must be firmly secured round the base of the head by twine, which is much better than wire if the fruits are to be immersed for any length of time. Tickets of wood should be attached, on which some mark may be cut or burnt. Metal labels should not be used. If it be impossible to preserve the whole head thus, a few drupes should be taken from about the centre of the head and placed in spirit, and the head tightly tied up in canvas and hung up to dry, when, if not handled, the drupes will dry adherent to the peduncle. If only dried drupes can be retained, particulars regarding the head, as to dimensions, form, colour, bracts, &c., should be noted, and the form of the drupes, and specially the nature of their stigmas, are to be looked to.

In the following list an asterisk (*) prefixed indicates a reference not confirmed. A point of interrogation (?) attached to a synonym indicates a doubt as to its being a synonym of the species under which it occurs.

The genera and the species are in all cases arranged in alphabetical order. It is to be noted also that the names of species which I consider good are printed in **antique** type, and they are numbered in alphabetical order. The names in SMALL CAPITALS are of species regarding which I have not sufficient information to pronounce them good species or mere synonyms. Many are horticulturists' names, which are doubtless worthless; and others are names to which either no or very short descriptions are appended in the works from which they are cited, and identification is impossible. With fuller information many will no doubt turn out good species. Names in *italics* are synonyms.

Ananas sylvestris, Burm. Thes. Zeyl. 20.
Cfr. Pandanus odoratissimus, *L. fil.*

Arthrodactylis spinosa, Forst. Gen. Pl. 150. t. lxxv.
Cfr. Pandanus odoratissimus, *L. fil.*

Barrotia altissima, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 277, t. xiv. f. 2.
Cfr. Pandanus Minda, *Vieill.*

B. aragoensis, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 278, t. xv. f. 5.
Cfr. Pandanus aragoensis.

B. Balansæ, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 281, t. xiv. f. 3.
Cfr. Pandanus Balansæ.

B. decumbens, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 285, t. xiv. f. 6.
Cfr. Pandanus decumbens.

B. diodon, Gaud. Atl. Bon. t. xiii. ff. 9–14.
Cfr. Pandanus furcatus, *Roxb.*

B. Gaudichaudi, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 264.
Cfr. Pandanus tetrodon, *Gaud.*

B. macrocarpa, Ad. Br. in. Ann. Sc. Nat. ser. 6, i. 279, t. xiv. f. 1.
Cfr. Pandanus macrocarpus, *Vieill.*

B. monodon, Gaud. Atl. Bon. t. xiii. ff. 15–24.
Cfr. Pandanus monodon.

B. Pancheri, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 283, t. xiv. f. 4.
Cfr. Pandanus Pancheri.

B. sphærocephala, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 284. t. xv. f. 7.
Cfr. Pandanus sphærocephalus, *Panch.*

B. tetrodon, Gaud. Atl. Bon. t. xiii. ff. 1–8.
Cfr. Pandanus tetrodon.

Bromelia sylvestris, Linn. Fl. Zeyl. 131.
Cfr. Pandanus odoratissimus, *L. fil.*

Bryantia butyrophora, Webb in Gaud. Atl. Bon. t. xx.
Cfr. Pandanus butyrophorus, *Krz.*

B. (*Lophostigma*) *oblonga*, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 288, t. xv. f. 8. Cfr. Pandanus oblongus.

B. (*Lophostigma*) *viscida*, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 287, t. xv. f. 9. Cfr. Pandanus viscidus, *Panch.*

Doornia reflexa, De Vriese in Kew Gard. Misc. vi. 266.
Cfr. Pandanus reflexus, *Lodd.*

Dorystigma madagascariense, Gaud. Atl. Bon. t. xxxi. ff. 12–13.
Cfr. Pandanus madagascariensis.

D. mauritianum, Gaud. Atl. Bon. t. xiii. ff. 25–27.
Cfr. Pandanus conglomeratus, *Balf. fil.*

Eydouxia Delesserti, Gaud. Atl. Bon. t. xviii. ff. 7–8.
Cfr. Pandanus odoratissimus, *L. fil.*

E. macrocarpa, Gaud. Atl. Bon. t. xviii. ff. 1–6.
Cfr. Pandanus Eydouxia, *Balf. fil.*

Fisquetia macrocarpa, Gaud. Atl. Bon. t. iv. ff. 2–8.
Cfr. Pandanus fœtidus, *Roxb.*

F. militaris, Gaud. Atl. Bon. t. v. ff. 2–7.
Cfr. Pandanus militaris.

F. ornata, Gaud. Atl. Bon. t. v. ff. 1, 8, 9.
Cfr. Pandanus ornatus, *Krz.*

F. ovata, Gaud. Atl. Bon. t. iv. f. 1.
Cfr. Pandanus ovatus, *Krz.*

Folium baggea maritimum, Rumph. Herb. Amb. iv. 151. tt. 80 & 75, f. A.
Cfr. Pandanus dubius, *Spreng.*

Folium baggea verum, Rumph. Herb. Amb. iv. 150.
Cfr. Pandanus dubius, *Spreng.*

Fouillioya graminifolia, Hort.
Cfr. Pandanus pygmæus, *Pet. Th.*

F. maritima, Gaud. Atl. Bon. t. xxvi. ff. 21–24.
Cfr. Pandanus Vandermeeschi, *Balf. fil.*

F. racemosa, Gaud. Atl. Bon. t. xxvi. ff. 1–9.
Cfr. Pandanus racemosus, *Krz.*

Hasskarlia globosa, Walp. Ann. i. 753.
Cfr. Pandanus utilis, *Bory.*

H. leucacantha, Walp. Ann. i. 753.
Cf. Pandanus odoratissimus, *L. fil.*

Heterostigma Heudelotianum, Gaud. Atl. Bon. t. xxv. ff. 15–31.
Cfr. Pandanus Heudelotianus.

Hombronia calathiphora, Gaud., Hombr. et Jacq. Voy. au Pôle Sud, Monoc. t. iii. Cfr. Pandanus calathiphorus.

H. edulis, Gaud. Atl. Bon. t. xxii. f. 17.
Cfr. Pandanus dubius, *Spreng.*

Jeanneretia littoralis, Gaud. Atl. Bon. t. xxv. ff. 1–7.
Cfr. Pandanus littoralis, *Krz.*

Kaida, Reede Hort. Mal. ii. tt. ii.–v.
Cfr. Pandanus Candelabrum, *Pal. Beauv.*

Kaida-taddi, Reede Hort. Mal. ii. tt. i. & vi.
Cfr. Pandanus odoratissimus, *L. fil.*

Kaida-Tsjerria, Reede Hort. Mal. ii. t. viii.
Cfr. Pandanus furcatus, *Roxb.*

Keura odorifera, Forsk. Fl. Ægypt.-Arab. xcv, cxxii, 172.
Cfr. Pandanus odoratissimus, *L. fil.*

Marquartia globosa, Hassk. Cat. Bog. 61 (excl. syn.).
Cfr. Pandanus utilis, *Bory.*

Marquartia leucacantha, Hassk. Cat. Bog. 61.
Cfr. Pandanus odoratissimus, *L. fil.*

PANDANUS ACUMINATUS.

Vinsonia acuminata, Gaud. MSS.

Hab. Madagascar.

P. ACUMINATUS, *Hort.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854), 45.

Hab. ——

P. AFFINIS, *Krz. in Seem. Journ. Bot.* v. (1867) 101 (syn. excl. et hab. emend.); *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 146; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 450.

Hab. Indian archipelago.

P. ALBUS, *Hort.*; *Steud. Nom. Bot.* (2nd ed.) ii. 251.

Hab. Indian archipelago.

P. altissimus, Panch. MSS.

Cfr. Pandanus Minda, *Vieill.*

P. amaryllidifolius, Hort.

Cfr. P. lævis, *Lour.*

P. AMARYLLIDIFOLIUS, *Voigt in Flora* (*Bot. Zeit.*) 1824, *Syll.* ii. 52. ? If *P. amaryllifolius*, Roxb.

1. **P. amaryllifolius**, *Roxb. Hort. Beng.* 71; *id. Flor. Ind.* iii. 743; *Kth. En. Pl.* iii. 100; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683; *Miq. Anal. Bot. Ind.* ii. 17; *id. Fl. Ind. Bat.* iii. 164; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 46 (*amaryllidifolius*).

P. Bidur, Jungh. MSS. (fid. Miq.).

P. latifolius, Rumph. Herb. Amb. iv. 146, t. lxxviii; Hassk. in Flora (Bot. Zeit.) 1842, Beibl. ii. 13; id. Cat. Bog. 60 (cum β); Miq. Fl. Ind. Bat. iii. 164; Krz. in Natuurk. Tijdschr. v. Ned. Ind. xxvii. 219; id. in Miq. Ann. Mus. Ludg.-Bat. ii. 54; id. in Seem. Journ. Bot. v. (1867) 105; id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 150; id. in Flora (Bot. Zeit.) lii. (1869) 454.

P. latissimus, Blum. Rumph. i. t. (physiognomonica) 53 (fid. Miq.); Hassk. Cat. Bog. 60; Miq. Anal. Bot. Ind. ii. 17; id. in Pl. Jungh. i. 166; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46; Flor. des Jard. des Pays-Bas v. (1862) 64; Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 52.

P. moschatus, Hort.; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 45.

P. odoratissimus, Blum. Cat. Bog. 111.

P. odoratus, Rumph. Herb. Amb. iv. 146.

Hab. Eastern archipelago.

Nom. vulg. "Keker moni" in Amboina, and "Pandang babouw" in

Malay (*Rumph.*); "Pandan rampeh gedeh" and "leutik" (*Hasskl.*); "Bidur" or "Bidoer" (*Miquel*); "Pandan Angriet" in Bangka (*Krz.*).

PANDANUS AMARYLLOIDES, *Hort.*; *Desf. Cat. Hort. Reg. Par.* 9; *Steud. Nom. Bot.* (2nd ed.) ii. 251.
Hab. ——

P. AMHERSTIÆ, *Hort.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 45.
Hab. ——

P. ANDAMANENSIS, *Hort.*
Hab. Andaman Islands.

2. **P. andamanensium**, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 148; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 452.
P. Leram, Krz. in Seem. Journ. Bot. v. (1867) 105 (excl. β and syn.) (*fid.* Krz.).
Hab. Andaman Islands.

P. ANGUSTIFOLIUS, *Hort.*; *Steud. Nom. Bot.* (2nd ed.) ii. 251.
Hab. ——

P. AQUATICUS, *Muell. in Kew Gard. Misc.* viii. 329; *id. Fragm. Phyt. Austr.* v. 40, & viii. 220.
Hab. North Australia.
Water-Pandanus in Leichhardt's 'Journal of the Australian Expedition.'

3. **P. aragoensis.**
Barrotia aragoensis, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 278, t. xv. f. 5.
Hab. New Caledonia.

4. **P. atrocarpus**, *Griff. Pl. Asiat.* iii. 160.
? *P. montanus*, Miq., Krz. in Seem. Journ. Bot. v. (1867) 129.
? *P. montanus*, Rumph. Herb. Amb. iv. 145; Miq. Fl. Ind. Bat. iii. 161.
P. sylvestris, Rumph. Herb. Amb. iv. 145, t. lxxvii.; Steud. Nom. Bot. (2nd ed.) ii. 251 (excl. syn. *P. ceramicus*, Rumph. and *P. conoideus*, Lam.); Miq. Fl. Ind. Bat. iii. 161; Krz. in Seem. Journ. Bot. v. (1867) 129; ?Parlat. Col. Bot. Mus. Florence (1874) t. 10.
P. terrestris, Rumph. Herb. Amb. iv. 145.
Hab. Malacca and Eastern archipelago.
Nom. vulg. "Pandang utan" or "ootan" in Malacca (*Griff.*); "Keker wassi," "Keker ewan," or "Leytewan" in Amboina, "Pandang gunong" or "Daun tickar" in Malay, "Areu" in Leytimor, "Tolun" in Hitoe (*Rumph.*).

P. AUSTRALIS, *Prest. in Cat. Hort. Trinid.* 77.
Hab. Australia.

Pandanus Bagea, Miq. Fl. Ind. Bat. iii. 159.
Cfr. P. dubius, *Spreng.*

5. **Pandanus Balansæ.**
Barrotia Balansæ, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 281, t. xiv. f. 3.
Hab. New Caledonia.

6. **P. Barklyi,** *Balf. fil. in Baker Flor. Maur. Seych.* 397.
P. sylvestris, Krz. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149; id. in Flora (Bot. Zeit.) lii. (1869) 453 (*silvestris*).
Vinsonia sylvestris, Gaud. Atl. Bon. t. xvii. ff. 16, 17; Walp. Ann. i. 756; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.
Hab. Mauritius.

Pandanus Bidur, *Jungh. MSS.
Miquel refers this to *P. latifolius*, Rumph., which is *P. amaryllifolius*, Roxb.; but Kurz regards it as *P. dubius*, Spreng. I have no means of determining which is right.

P. Blancoi, Kth. En. Pl. iii. 583.
Cfr. P. odoratissimus, *L. fil.*

P. Boryi, Gaud. Atl. Bon. t. xxii. f. 15.
Cfr. P. odoratissimus, *L. fil.*

P. Boucheanus, *C. Koch in Wochenschr.* (1858) 131.
P. latifolius, Hort.; Lodd. (*fid.* Koch, *l. c.*).
?*P. Pervilleanus*, Krz. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149 (excl. syn. *Vinsonia drupacea*, Gaud.); id. in Flora (Bot. Zeit.) lii. (1869) 453 (excl. syn.).
?*Vinsonia Pervilleana*, Gaud. Atl. Bon. t. xxxi. ff. 1–7 (fid. Koch. *l. c.*); Walp. Ann. i. 756; Wendl. Ind. Palm. Cyclanth. Pand Cycad. (1854) 48; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Madagascar.

P. bromeliæfolius, *Hort.*; *Desf. Cat. Hort. Reg. Par.* 9; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 48.
Hab. Ile de la Réunion.

7. **P. butyrophorus,** *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 150; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 454.
Bryantia butyrophora, Webb in Gaud. Atl. Bon. t. xx.; Walp. Ann. i. 754; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 286, 291.
Hab. ——

P. calathiphorus.
Hombronia calathiphora, Gaud.; Hombr. et Jacq. Voy. au Pôle Sud, Monocot. t. iii.
Hab. Iles Salomon.

Pandanus Candelabrum, De Vriese in Kew Gard. Misc. vi. 285.
Cfr. P. Candelabrum, *Pal. Beauv.*

P. Candelabrum, Hook. Bot. Mag. t. 5014 (syn. excl.).
Cfr. P. utilis, *Bory.*

8. **Pandanus Candelabrum,** *Pal. Beauv. Fl. d'Ow. et Ben.* i. 37, tt. xxi, xxii; *Pers. Synops.* ii. 597 (syn. excl.); *Lam. Encyc. Bot. Suppl.* i. 576 (Baquois candelabre); *Spreng. Syst. Veg.* iii. 898; *Kth. En. Pl.* iii. 96; *Steud. Nom. Bot.* (2nd ed.) ii. 251 (syn. excl.); *Voigt Cat. Hort. Calc.* 683; *Miq. Anal. Bot. Ind.* ii. 17; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 45; *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 148; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 452.

Pandanus Candelabrum, De Vriese in Kew Gard. Misc. vi. 285; id. in Tuinbouw Flora i. 169.

?*P. javanicus,* Hort. (fid. Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 45. Var. *glaucescens,* Hort.; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46; *Album Dallière ii. (1874) t. 41. Var. *variegatus,* Hort.; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46; The Garden iii. (1873) 18, c. ic. xyl.

Tuckeya Candelabrum, Gaud. Atl. Bon. t. xxvi. ff. 10–20; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Guinea.

P. caricosus, Hort.; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46. *Cfr.* P. furcatus, *Roxb.*

P. caricosus, Miq. Anal. Bot. Ind. ii. 16.
Cfr. P. furcatus, *Roxb.*

P. caricosus, Rumph. Herb. Amb. iv. 154.
Cfr. P. caricosus, *Spreng.*

P. CARICOSUS, *Seem. Flor. Vitiens.* 281.
Hab. Fiji.
Nom. vulg. "Kiekie" or "Voivoi."

9. **P caricosus,** *Spreng. Syst. Veg.* iii. 897.

P. caricosus, Rumph. Herb. Amb. iv. 154; Kth. En. Pl. iii. 98; Steud. Nom. Bot. (2nd ed.) ii. 251; Hassk. in Flora (Bot. Zeit.) 1842, Beibl. ii. 13; id. Cat. Bog. 60; Voigt Cat. Hort. Calc. 683; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 45 (syn. excl.); Miq. Fl. Ind. Bat. iii. 163; Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 54; id. in Seem. Journ. Bot. v. (1867) 100, t. lxii. ff. 1–3 (syn. excl.); id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 146; id. in Flora (Bot. Zeit.) lii. (1869) 450.

Hab. Indian archipelago.

Nom. vulg. "Pandang ayer" in Malay, "Lassiaal" in Amboina, "Lasiattal" in Hitoe, "Lackiabit" in Bonoa (*Rumph.*); "Harassus gedeh" (*Hasskl.*); "Sarengseng" in Java (*Krz.*).

PANDANUS CAULIFLORUS, *Carm. MSS.*
Hab. Mauritius.

P. ceramensis, Hort.
Cfr. P. conoideus, *Lam.*

P. ceramicus, Rumph. Herb. Amb. iv. 149. t. lxxix.
Cfr. P. conoideus, *Lam.*

P. Chamissonis, Gaud. Atl. Bon. t. xxii. f. 9.
Cfr. P. odoratissimus, *L. fil.*

10. **P. conglomeratus,** *Balf. fil. in Baker Flor. Maur. Seych.* 403.
? *Dorystigma mauritianum,* Gaud. Atl. Bon. t. xiii. ff. 25–27; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Mauritius.
Possibly this is *P. reflexus,* De Vriese.

P. conoideus, De Vriese in Kew Gard. Misc. vi. 264.
Cfr. P. montanus, *Bory.*

11. **P. conoideus,** *Lam. Encyc. Bot.* i. 372 (excl. β) (Baquois conoïde); *Spreng. Syst. Veg.* iii. 898 (excl. syn. P. sylvestris, *Rumph.*); *Boj. Hort. Maur.* 303 (excl. syn. P. conoideus, *Pet. Th.*, et hab. "Maurice"); *Pritz. Ind. Icon.* 793 (*concidens*).
P. ceramensis, Hort.; Hamb. Gartenzeit. xix. (1863) 197 (fid. Koch in Wochenschr. xv. (1872) 239.
P. ceramicus, Rumph. Herb. Amb. iv. 149. t. lxxix.; Kth. En. Pl. iii. 98 (excl. syn. *P. sylvestris,* Rumph.); Miq. Flor. Ind. Bat. iii. 162; Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 54; id. in Seem. Journ. Bot. v. (1867) 104; id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 147; id. in Flora (Bot. Zeit.) lii. (1869) 451.
Hab. Indian archipelago.
Nom. vulg. "Pandang ceram" in Malay, "Saun" or "Saoen" in Ceram, "Sipa sipa" in Ternate, and "Kleba" in Boeroe (*Rumph.*).

P. conoideus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 5.
Cfr. P. prostratus, *Balf. fil.*

P. crassipes, Wall.
Cfr. P. furcatus.

P. CYLINDRICUS, *Hort.*
Hab. ——

P. DECORUS, *Hort.*; *Wochenschr.* xiii. (1870) 166; *Gartenflor.* xx. (1871) 24.
Hab. New Caledonia.

12. **P. decumbens.**
Barrotia decumbens, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 285, t. xv. f. 6.
Hab. New Caledonia.

Pandanus deflexus, Hort.

Cfr. P. Doornianus, *De Vriese.*

P. demissus, Soland. in Herb. Banks; id. Prim. Flor. Ins. Pacif. (ined.) 352.

Is *Freycinetia demissa,* Br. & Benn. Fl. Jav. i. 32, 34.

P. distichus, Hort.; Ill. Hort. xix. (1872) 55.

Cfr. P. utilis, *Bory.*

PANDANUS DOORNIANUS, *De Vriese; Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 45.

P. deflexus, Hort. (fid. Wendl. *l. c.*).

P. longifolius, Hort. (fid. Wendl. *l. c.*); Steud. Nom. Bot. (2nd ed.) ii. 251.

Hab. Ile de la Réunion.

P. Douglasii, Gaud. Atl. Bon. t. xxii. f. 16.

Cfr. P. odoratissimus, *L. fil.*

13. **P. drupaceus,** *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 4; *id. in* **Desv. Journ. de Bot.* i. 45; *Lam. Encyc. Bot. Suppl.* i. 576; *Spreng. Syst. Veg.* iii. 898; *Boj. Hort. Maur.* 302; *Kth. En. Pl.* iii. 96; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683; *Krz. in Seem. Journ. Bot.* v. (1867) 132; *Balf. fil. in Baker Flor. Maur. Seych.* 400.

P. strigilis, Carm. MSS.

Hab. Mauritius.

Nom. vulg. Baquois marron.

14. **P. dubius,** *Spreng. Syst. Veg.* iii. 897 (excl. syn. P. erigens, *Pet. Th.* et hab. ins. Mascaren.); *Boj. Hort. Maur.* 301 (excl. syn. et hab. ins. Mascaren.); *Kth. En. Pl.* iii. 95; *Steud. Nom. Bot.* (2nd ed.) ii. 251 (excl. syn.); *Miq. Flor. Ind. Bat.* iii. 159; *Krz. in Seem. Journ. Bot.* v. (1867) 127, t. lxiv. ff. 0–2; *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 148 (excl. syn. Barrotia tetrodon, *Gaud.*); *id. in Flora (Bot. Zeit.)* vii. (1869) 452 (excl. syn. Barrotia tetrodon, *Gaud.*).

Folium baggea maritimum, Rumph. Herb. Amb. iv. 151, tt. lxxx. & lxxv. fig. A.

Folium baggea verum, Rumph. Herb. Amb. iv. 150.

?*Hombronia edulis,* Gaud. Atl. Bon. t. xxii. f. 17; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Pandanus Bagea, Miq. Flor. Ind. Bat. iii. 159; Krz. in Seem. Journ. Bot. v. (1867) 130.

P. Bidur, *Jungh. MSS.; Miq. Pl. Jungh. i. 166 (fid. Krz. *l. c.*).

?*P. edulis,* De Vriese in Kew Gard. Misc. vi. 264.

P. fascicularis β, Lam. Encyc. Bot. i. 372.

P. latissimus, Blum. Rumph. i. t. (physiognomonica) 53 (fid. Krz. *l. c.*); Hassk. Cat. Bog. 60; Miq. Anal. Bot. Ind. ii. 17; id.

Pl. Jungh. i. 166; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46; Flor. des Jard. des Pays-Bas v. (1862) 64; Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 52.

P. magnus, Rumph. Herb. Amb. iv. 150.

Hab. Indian archipelago.

Nom. vulg. "Haun pantey" or "Daun baggea" in Malay, "Haun laynulun" or "Haun wassi" in Amboina, "Ima" or "Imæ" in Ceram, "Wacun ranu" in Banda, "Areu" or "Pandang wang" in Java (*Rumph.*); "Bidur" or "Bidoer" in Java (*Miquel*); "Paoun" in Iles Mariannes (*Gaud.*).

Pandanus edulis, De Vriese in Kew Gard. Misc. vi. 264.
Cfr. P. dubius, *Spreng.*

PANDANUS EDULIS, *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 5; *id. in *Desv. Journ. de Bot.* i. 47; *Lam. Encyc. Bot. Suppl.* i. 577 (Baquois comestible); *Spreng. Syst. Veg.* iii. 898; *Kth. En. Pl.* iii. 99; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683; *Krz. in Seem. Journ. Bot.* v. (1867) 131.

Hab. Madagascar.

P. elegans, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 4.
Cfr. P. sylvestris, *Bory.*

P. elegantissimus, Hort., and var. *latifolius,* Hort.
Cfr. P. utilis, *Bory.*

P. ENSIFOLIUS, *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 4; *id. in Desv. Journ. de Bot.* i. 46; *id. Prod. Phyt. in Mélanges*; *Lam. Encyc. Bot. Suppl.* i. 576 (Baquois ensiforme); *Spreng. Syst. Veg.* iii. 898; *Boj. Hort. Maur.* 301 (excl. hab.); *Kth. En. Pl.* iii. 97; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Krz. in Seem. Journ. Bot.* v. (1867) 133.

Hab. Madagascar.

Nom. vulg. "Sitchiric."

P. erigens, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 5.
Cfr. P. montanus, *Bory.*

P. EXALTATUS, *Blanco Fl. de Filip.* 778; *Kth. En. Pl.* iii. 584; *Miq. Flor. Ind. Bat.* iii. 163; *Krz. in Seem. Journ. Bot.* v. (1867) 130.

Hab. Philippines.

Nom. vulg. "Alas-as."

15. **P. Eydouxia,** *Balf. fil. in Baker Flor. Maur. Seych.* 401.
Eydouxia macrocarpa, Gaud. Atl. Bon. t. xviii. ff. 1–6; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Mauritius.

P. fascicularis, Lam. Encyc. Bot. i. 372 (excl. β).
Cfr. P. odoratissimus, *L. fil.*

Pandanus fascicularis β, Lam. Encyc. Bot. i. 372.
Cfr. P. dubius, *Spreng.*

P. flabelliformis (*flagelliformis*), E. Carr. Rev. Hort. 1866, 271 (cum ic.).
Cfr. P. utilis, *Borg.*

16. **Pandanus fœtidus,** *Roxb. Hort. Beng.* 71; *id. Flor. Ind.* iii. 742; *id. Icon. ined.* tt. 994, 995; *Kth. En. Pl.* iii. 98; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 45; *Miq. Flor. Ind. Bat.* iii. 160; *Krz. in Seem. Journ. Bot.* v. (1867) 101, t. lxii. ff. 4–6; *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 146; *id. in Flora (Bot. Zeit.)* lii. (1869) 450.
Fisquetia macrocarpa, Gaud. Atl. Bon. t. iv. ff. 2–8; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Bengal; Assam.

Nom. vulg. "Keur-kanta" (*Hind.*), "Kea-kanta" (*Beng.*), "Munden," "Kede-pu."

P. Forsteri, *Moore & Muell. Frag. Phyt. Austr.* vii. tab. and viii. 220.

Hab. Lord Howe's Island.

P. fragrans, *Gaud. Atl. Bon.* t. xxii. f. 10; *Walp. Ann.* i. 752; *Ad. Br. in Ann. Sc. Nat.* ser. 6, i. 274, 290, t. xv. f. 10.
P. pedunculatus, R. Br. ex Muell. Fragm. partim (fid. Ad. Br.).

Hab. Iles Mariannes.

P. freycinetioides, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 151; *id. in Flora (Bot. Zeit.)* lii. (1869) 455.
Souleyetia freycinetioides, Gaud. Atl. Bon. t. xix.; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. ——

I am doubtful if this is a *Pandanus.*

17. **P. furcatus,** *Roxb. Hort. Beng.* 71; *id. Flor. Ind.* iii. 744; *Spreng. Syst. Veg.* iii. 898; *Kth. En. Pl.* iii. 98; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Hassk. in Flora (Bot. Zeit.)* 1842, *Beibl.* ii. 12; *id. Decad. in Tijdschr. Hoev. & De Vriese* ix. 170; *id. Cat. Hort. Bog.* 60; *id. Pl. Jav. Rar.* 163; *Voigt Cat. Hort. Calc.* 683; *Miq. Anal. Bot. Ind.* ii. 10, t. ii.; *id. in Pl. Jungh.* i. 166; *id. Flor. Ind. Bat.* iii. 162, t. xxxvii; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 45; *Dalz. & Gibs. Bomb. Flor.* 279; *Flor. des Jard. des Pays-Bas* iv. (1861) 111; ?*Thw. En. Pl. Zeyl.* 327; *Krz. in Miq. Ann. Mus. Lugd.-Bat.* ii. 54; *id. in Seem. Journ. Bot.* v. (1867) 102; *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 147; *id. in Flora (Bot. Zeit.)* lii. (1869) 451.
Barrotia diodon, Gaud. Atl. Bon. t. xiii. ff. 15–24; Walp. Ann. i. 754; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Kaida Tsjerria, Reede Hort. Mal. ii. t. viii.

Pandanus caricosus, Hort. (fid. Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46).
P. caricosus, Miq. Anal. Bot. Ind. ii. 16 (fid. Miquel).
P. crassipes, Wall.
P. horridus, *Rnwdt. MSS.; Bl. Cat. Bog. 111 (fid. Hasskl.).
P. Lais, Kurz in Miq. Ann. Mus. Lugd.-Bat. ii. 54 (fid. Krz.); id. in Natuurk. Tijdschr.v. Ned. Ind. xxvii. 218; Wochenschr. xiv. (1871) 183.
P. spinifructus (*spinifractus*, Krz.), Dennst. Clav. Hort. Mal. 11.
P. urophyllus, Hance in Trim. Journ. Bot. iv. (1875) 68.
Ryckia furcata, De Vriese in Versl. kl. Akad. Wet. ii. (1854) 203; id. in Kew Gard. Misc. vi. 268; id. in Linnæa xxvi. 764; id. in Tuinbouw Flora i. 177; id. in Flor. des Jard. des Pays-Bas i. (1858) 25; Walp. Ann. v. 858.

Hab. From Himalayas to Indian archipelago, also Ceylon.

Nom. vulg. "Tjankúang" or "Bangkoang," "O-kaiyeya" in Ceylon (*Thwaites*); "Lais" in Eastern archipelago and "Korr" in Sikkim (*Kurz*).

PANDANUS GLAUCESCENS, *Hort.*; *Proc. Roy. Hort. Soc.* v. (1865) 143.
Hab. ——

P. glaucus, Hort.
Cfr. P. sessilis, *Hort.*

P. globuliferus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 5.
Cfr. P. sphæroideus, *Pet. Th.*

P. GRACILIS, *Blanco Fl. de Filip.* 778; *Kth. En. Pl.* iii. 584; *Krz. in Seem. Journ. Bot.* v. (1867) 130.
Hab. Philippines.

P. gramineus, Hort., is *Freycinetia graminea*, Bl.

P. graminifolius, Hort.; Miq. Anal. Bot. Ind. ii. 17, is *Freycinetia leucacantha*, Miq.

18. **P. graminifolius**, *Kurz in Seem. Journ. Bot.* v. (1867) 104; *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 147; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 451.
Hab. Tenasserim.

19. **P. helicopus**, *Krz. in Miq. Ann. Mus. Lugd.-Bat.* ii. 54, t. ii; *id. in Natuurk. Tijdschr. v. Ned. Ind.* xxvii. 219; *id. in Seem. Journ. Bot.* v. (1867) 101; *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 147; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 451.
Hab. Banca.
Nom. vulg. "Rassouw."

20. **P. heterocarpus**, *Balf. fil. in Baker Flor. Maur. Seych.* 399.
Hab. Rodriguez.

Nom. vulg. "Vacoa Calé rouge et blanc," "Vacoa sac," "V. poteau," "V. parasol," "V. mâle;" "Pavilion" of Leguat.

PANDANUS HEUDELOTIANUS.

Heterostigma Heudelotianum, Gaud. Atl. Bon. t. xxv. ff. 15–31; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Senegambia.

Nom. vulg. "Fang-Jani" (*Le M. et Dcne*).

P. HOFFA, **Chapelier MSS.*; *Boj. Hort. Maur.* 303.

Hab. Madagascar.

Nom. vulg. "Hoffa" (*Malg.*); "Vacoua sans épines" (*Maur.*).

21. **P. Hornei**, *Balf. fil. in Baker Flor. Maur. Seych.* 397.

Hab. Seychelles.

P. horridus, *Rnwdt. MSS.

Cfr. P. furcatus, *Roxb.*

P. HOULLETII, *E. Carr. in Rev. Hort.* 1868, 210, f. 23.

Hab. Singapore.

P. humilis, Jacq. Fragm. 21, t. xiv. f. 2.

Cfr. P. sylvestris, *Bory.*

P. humilis, Lour. Flor. Cochin. 603 (excl. syn. *Kaida taddi*, Reede).

Cfr. P. polycephalus, *Lam.*

P. humilis, Rumph. Herb. Amb. iv. 143, t. lxxvi.

Cfr. P. polycephalus, *Lam.*

22. **P. Iceryi**, *Horne MSS.*; *Balf. fil. in Baker Flor. Maur. Seych.* 400.

Hab. Mauritius.

P. inclinans, Soland. in Herb. Banks. is *Freycinetia Banksii*, A. Cunn.

P. INERMIS, *Blanco Flor. de Filip.* (2nd ed.) 537.

Hab. Philippines.

P. inermis, Rnwdt. in Bl. Cat. Bog. 111.

Cfr. P. lævis, *Lour.*

P. inermis, Roxb. Hort. Beng. 71.

Cfr. P. lævis, *Lour.*

P. INTEGRIFOLIUS, *Lour.*; *Steud. Nom. Bot.* (2nd ed.) ii. 251.

Hab. China; East Indies.

P. javanicus, Hort., and var. *glaucescens*, Hort., and var. *variegatus*, Hort. *Cfr.* P. Candelabrum, *Pal. Beauv.*

23. **P. Kaida**, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 148 (excl. syn.); *id. in Flora* (*Bot. Zeit.*) lii. (1869) 452 (excl. syn.).

Kaida, Reede Hort. Mal. ii. tt. ii.–v.

P. Candelabrum, Krz. in Seem. Journ. Bot. v. (1867) 127 (excl. syn.).

24. **P. labyrinthicus**, *Krz. in Miq. Ann. Mus. Lugd.-Bat.* ii. 53; *id. in Seem. Journ. Bot.* v. (1867) 103; *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 147; *id. in Flora* (*Bot. Zeit.*) lii. (1869) 451.

Hab. Sumatra.

Nom. vulg. "Attoenoe," or "Pandan."

MISSOURI

25. **Pandanus lævis**, *Lour. Flor. Cochin.* 604; *Willd. Sp. Pl.* iv. 646 (glattrippiger Pandanus); *Pers. Synops.* ii. 597; *Lam. Encyc. Bot. Suppl.* i. 575 (Baquois lisse); *Spreng. Syst. Veg.* iii. 898; *Steud. Nom. Bot.* (2nd ed.) ii. 251.

P. amaryllidifolius, Hort. Amst. et Paris (fid. Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46).

P. inermis, Rnwdt., Blum. Cat. Bog. 111; Hasskl. in Flora (Bot. Zeit.) 1842, Beibl. ii. 13; id. Cat. Bog. 60.

P. inermis, Roxb. Hort. Beng. 71; Flor. Ind. iii. 744; Kth. En. Pl. iii. 100; Steud. Nom. Bot. (2nd ed.) ii. 251; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46 (excl. hab. et syn.).

P. lævis, Rumph. Herb. Amb. iv. 148; Kth. En. Pl. iii. 100; Hasskl. Cat. Bog. 60; id. Pl. Jav. Rar. 163; Miq. Anal. Bot. Ind. ii. 17; Wall. Cat. 8589; Krz. in Seem. Journ. Bot. v. (1867) 126; id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149; id. in Flora (Bot. Zeit.) lii. (1869) 453; id. Flor. Brit. Birm. ii. 508.

P. longifolius, Hort. Berol. et Ins. pav. Potsd. (fid. Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46).

P. moschatus, Rumph. Herb. Amb. iv. 147; Voigt Cat. Hort. Calc. 682; Clegh. Cat. Hort. Madr. 24; Miq. Flor. Ind. Bat. iii. 165; Krz. in Natuurk. Tijdschr. v. Ned. Ind. xxvii. 219; id. in Miq. Ann. Mus. Lugd.-Bat. ii. 52.

P. odoratissimus, Noronh. Pl. Jav. in Verh. Bat. Genootsch. v. 83.

Hab. Indian archipelago, Cochin China.

Nom. vulg. "Lá buon," "Lá khai" (*Lour.*); "Pandang casturi" in Malay, "Patat" in Java, "Pandang lengis" in Balay (*Rumph.*); "Haraghag" (*Hasskl.*); "Poedak" or "Púdak" (*Miquel & Hasskl.*).

P. lævis, Rumph. Herb. Amb. iv. 148.

Cfr. P. lævis, *Lour.*

P. LAGENÆFORMIS.

Sussea lagenæformis, Gaud. Atl. Bon. t. xxv. ff. 11–14; Walp. Ann. i. 755; Ad. Br. in. Ann. Sc. Nat. ser. 6, i. 291.

Hab. ——

P. LAIS, Hort.

Hab. Moluccas.

P. Lais, Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 54.

Cfr. P. furcatus, *Roxb.*

P. latifolius, Hort.

Cfr. P. polycephalus, *Lam*

P. latifolius, Hort. Lodd.

Cfr. P. Boucheanus, *C. Koch.*

P. latifolius, Rumph. Herb. Amb. iv. 146, t. lxxviii.

Cfr. P. amaryllifolius, *Roxb.*

Pandanus latifolius, Voigt in Flora (Bot. Zeit.) 1824, Syll. ii. 52.
? If *P. latifolius,* Hort.

P. latissimus, Blume Rumph. i. t. (physiognomonica) 53.
Miquel refers this species to *P. latifolius,* Rumph., which is *P. amaryllifolius,* Roxb.; Kurz identifies it with *P. dubius,* Spreng.

PANDANUS LEONENSIS, *Hort.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 46.
Hab. Guinea.

26. **P. Leram,** *Jones in Voigt Cat. Hort. Calc.* 683; *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 148; *id. in Flora (Bot. Zeit.)* lii. (1869) 452; *id. Flor. Brit. Birm.* ii. 507.
Mellori, Asiat. Res. 161 (c. tab.).
P. Leram β. macrocarpa, Krz. in Seem. Journ. Bot. v. (1867) 106 (fid. Kurz).
P. Millore, Roxb. Hort. Beng. 71; *Icon. ined. xv. 4 (fid. Kurz).
Roussinia indica, Gaud. Atl. Bon. t. xxi. ff. 1–4; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Nicobar and Andaman Islands.
Nom. vulg. "Mangdat;" "Larum" or "Leram" in Andaman Islands; "Mellori" in Portuguese; Nicobar Bread-fruit.

P. Leram, Krz. (non Jones) in Seem. Journ. Bot. v. (1867) 105 (excl. β).
Cfr. P. andamanensium, Krz.

P. Leram β. macrocarpa, Krz. in Seem. Journ. Bot. v. (1867) 106.
Cfr. P. Leram, Jones.

P. leucacanthus, Hort.
Cfr. P. odoratissimus, *L. fil.*

P. leucanthus, Hasskl. in Flora (Bot. Zeit.) 1842, Beibl. ii. 14.
Cfr. P. odoratissimus, *L. fil.*

P. Linnæi, Gaud. Atl. Bon. t. xxii. ff. 1–8.
Cfr. P. odoratissimus, *L. fil.*

P. LINNEI, *Hort.*
Hab. ——

P. littoralis, *Jungh. Topogr. Nat. Reise d. Java 61 (fid. Kurz.).
Cfr. P. odoratissimus, *L. fil.*

P. LITTORALIS, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 150; *id. in Flora (Bot. Zeit.)* lii. (1869) 454.
Jeanneretia littoralis, Gaud. Atl. Bon. xxv. ff. 1–7; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Indian archipelago.

P. LIVIDUS, *Hort.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 46.
Hab. ——

Pandanus longifolius, Hort. Berol. et Ins. pav. Potsd.
Cfr. P. lævis, *Lour.*

P. longifolius, Hort. Lodd.
Cfr. P. Doornianus, *De Vriese.*

P. Loureiri, Gaud. Atl. Bon. t. xxii. f. 13.
Cfr. P. odoratissimus, *L. fil.*

P. lucidus, Wall.
Cfr. P. sylvestris, *Bory.*

PANDANUS MACROCARPUS, *Hort.*
Hab. ——

27. **P. macrocarpus,** *Vieill. in Ann. Sc. Nat.* ser. 4, xvi. 51.
Barrotia macrocarpa, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 279, t. xiv. f. 1.
Hab. New Caledonia.
Nom. vulg. " Kelléte."

P. MADAGASCARIENSIS.
Dorystigma madagascariense, Gaud. Atl. Bon. t. xxxi. ff. 12–13; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Madagascar.

This may be merely a small form of *Dorystigma mauritianum,* Gaud., for which see *Pandanus conglomeratus,* Balf. fil.

P. magnus, Rumph. Herb. Amb. iv. 150.
Cfr. P. dubius, *Spreng.*

P. MALATENSIS, *Blanco Fl. de Filip.* (2nd ed.) 536.]
Hab. Philippines.

P. MARGINATUS, *Roxb. Hort. Beng.* 71; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683.
Hab. Ind. or., Mauritius.

P. maritimus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 4.
Cfr. P. utilis, *Bory.*

P. maritimus, *Rumph.
Cfr. P. odoratissimus, *L. fil.*

P. mauritianus, Hort.; Ill. Hort. vii. (1860) t. 265.
Cfr. P. utilis, *Bory.*

P. mauritianus, Hort. Berol. et Ins. pav. Potsd.
Cfr. P. sylvestris, *Bory.*

P. Menziesii, Gaud. Atl. Bon. t. xxii. f. 14.
Cfr. P. odoratissimus, *L. fil.*

28. **P. microcarpus,** *Balf. fil. in Baker Flor. Maur. Seych.* 396.
P. microcarpus, Carm. MSS.
Hab. Mauritius.

Pandanus microcarpus, Carm. MSS.
Cfr. P. microcarpus, *Balf. fil.*

PANDANUS MICROSTIGMA.
Sussea microstigma, Gaud. Atl. Bon. t. xxxviii.; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Madagascar.

P. MILITARIS.
Fisquetia militaris, Gaud. Atl. Bon. t. v. ff. 2–7; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Singapore.

P. Millore, Roxb. Hort. Beng. 71.
Cfr. P. Leram, *Jones*.

P. Minda, *Panch. in herb.
Cfr. Pandanus oblongus.

29. **P. Minda,** *Vieill. in Ann. Sc. Nat.* ser. 4, xvi. 51.
Barrotia altissima, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 277, 289. t. xiv. f. 2.
P. altissimus, Panch. MSS. (fid. Ad. Br.).
Hab. New Caledonia.
Nom. vulg. "Minda."

30. **P. minor,** *Wall. Cat*. 8592.
Hab. Northern India.

P. MONODON.
Barrotia monodon, Gaud. Atl. Bon. t. xiii. ff. 15–24; Walp. Ann. i. 754; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Cochin China.

31. **P. montanus,** *Bory Voy*. i. 313.
P. conoideus, De Vriese in Kew Gard. Misc. vi. 264.
P. erigens, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 5; id. in *Desv. Journ. de Bot. i. 46; Lam. Encyc. Bot. Suppl. i. 577 (Baquois redressé); Kth. En. Pl. iii. 97; Krz. in Seem. Journ. Bot. v. (1867) 130.
P. pyramidatus, Carm. MSS.
Sussea conoidea, Gaud. Atl. Bon. t. xxiv.; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
Hab. Bourbon. Madagascar (fid. Gaud.).
Nom. vulg. "Vacoa marron."

P. montanus, Miq., Krz. in Seem. Journ. Bot. v. (1867) 129.
Cfr. P. atrocarpus, *Griff.*

P. montanus, Rumph. Herb. Amb. iv. 145.
Cfr. P. atrocarpus, *Griff.*

32. **Pandanus monticola,** *Muell. Frag. Phyt. Austr.* v. 40, vii. 63, viii. 220, ix. 193; *Benth. Flor. Austr.* vii. 150.

Hab. Australia.

P. moschatus, Rumph. Herb. Amb. iv. 147.
Cfr. P. lævis, *Lour.*

P. MURICATUS, *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 6; *id. in *Desv. Journ. de Bot.* i. 48; *Lam. Encyc. Bot. Suppl.* i. 577 (Baquois herissé); *Spreng. Syst. Veg.* iii. 898 (muriatus); *Boj. Hort. Maur.* 301; *Kth. En. Pl.* iii. 97; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Krz. in Seem. Journ. Bot.* v. (1867) 131.

Hab. Madagascar.

Nom. vulg. "Vacoua en pyramide" (*Bojer*).

33. **P. multispicatus,** *Balf. fil. in Baker Flor. Maur. Seych.* 403.

Hab. Seychelles.

Nom. vulg. "Vacoua de rivière."

P. nitidus, Krz. in Seem. Journ. Bot. v. (1867) 103.
Cfr. P. stenophyllus, *Krz.*

P. nudus, Pet. Th. Bull. Sc. Soc. Phil. Paris (août 1808) 4.
Cfr. P. utilis, *Bory.*

P. OBELISCUS, *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 6; *id. in *Desv. Journ. de Bot.* i. 49; *Lam. Encyc. Bot. Suppl.* i. 578; *Kth. En. Pl.* iii. 100; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Krz. in Seem. Journ. Bot.* v. (1867) 133.

Hab. Madagascar.

34. **P. oblongus.**

Bryantia (Lophostigma) oblonga, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 288, t. xv. f. 8.

Pandanus Minda, *Panch. in herb. (non Vieill.) (fid. Ad. Br. *l. c.*).

Hab. New Caledonia.

P. odoratissimus, Bl. Cat. Bog. 111.
Cfr. P. amaryllifolius, *Roxb.*

P. ODORATISSIMUS, *Hort. Herrenh.* No. i.; *Hort. Berol., Makoy, Lodd.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 46.

P. utilis, Hort. Amst. et Brux. (fid. Wendl.).

Hab. ——

P. ODORATISSIMUS, *Hort. Herrenh.* No. ii.; *Hort. Parment. Gand.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47.

Hab. ——

P. odoratissimus, Jacq. Fragm. Bot. 21, tt. xiii. xiv. f. 1.
Cfr. P. utilis, *Bory.*

35. **P. odoratissimus,** *L. fil. Suppl.* 424; *Lam. Encyc. Bot.* i. 371 (excl. syn. Kaida, *Reede*) (Baquois odorant); *id. Suppl.* i. 575; *id. Illustr.*

t. 798; *Murr. Syst. Veg.* 878 (odoratissima); *Forst. Flor. Ins. Aust. Prod.* 69 (odoratissima); *id. Pl. Escul. Ins. Oc. Austr.* 38 (odoratissima, excl. β, γ, δ); *Roxb. Fl. Corom.* i. 65. tt. 94–96; *id. Hort. Beng.* 71; *id. Flor. Ind.* iii. 738 (excl. syn. Mellore); *Desf. Tabl. du Mus. Par.* 217; *id. Cat. Hort. Reg. Par.* 9; *Willd. Sp. Pl.* iv. 645 (excl. syn. *Jacq.*); *Pers. Synops.* ii. 597 (excl. syn. *Jacq.*); *Pet. Th. Prod. Phyt. in Mélang.*; *Spreng. Syst. Veg.* iii. 897; *Kerner Hort. Semp.* tt. 133–136; *Guill. in Ann. Sc. Nat.* ser. 2, vii. 177; *Grah. Cat. Pl. Bomb.* 227; *Kth. En. Pl.* iii. 94; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 682 (excl. syn. *Reede*); *Griff. Pl. Asiat.* iii. 159, t. 174; *Clegh. Cat. Hort. Madr.* (1853) 24; *De Vriese in Kew Gard. Misc.* vi. 261 (excl. syn. *Jacq.*); *id. in Tuinbouw Flora* i. 166 (excl. syn. *Jacq.*); *Miq. Flor. Ind. Bat.* iii. 156 (excl. syn. Kaida, *Reede*); *Dalz. & Gibs. Bomb. Flor.* 279; *Vieill. in Ann. Sc. Nat.* ser. 4, xvi. 50; *Thw. En. Pl. Zeyl.* 327; *Krz. in Miq. Ann. Mus. Lugd.-Bat.* ii. 52; *id. Flor. Brit. Birm.* ii. 508; ?*Muell. Fragm. Phyt. Austr.* viii. 220; *Balf. fil. in Baker Flor. Maur. Seych.* 401; **Ann. de l'Agric. des Colonies* iv. 5; ?*Benth. Flor. Austr.* vii. 148.

Ananas sylvestris, Burm. Thes. Zeyl. 20.

Arthrodactylis spinosa, Forst. Gen. Pl. 150, t. lxxv.

Bromelia sylvestris, Linn. Flor. Zeyl. 131; Burm. Fl. Ind. 79.

Eydouxia Delessertii, Gaud. Atl. Bon. t. xvii. ff. 7–8; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hasskarlia leucacantha, Walp. Ann. i. 753 (fid. Krz.).

Kaida-taddi, Reede Hort. Mal. ii. tt. i. & vi.

Keura odorifera, Forsk. Fl. Ægypt.-Arab. 172, xcv, cxxii.

Marquartia leucacantha (*leucantha*), Hassk. Cat. Bog. 61.

Pandanus Blancoi, Kth. En. Pl. iii. 583; Proc. Roy. Hort. Soc. iv. (1864) 158.

P. Boryi, Gaud. Atl. Bon. t. xxii. f. 15; Walp. Ann. i. 752; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

P. Chamissonis, Gaud. Atl. Bon. t. xxii. f. 9; Walp. Ann. i. 752; Ad. Br. in Ann. Sc. Nat. ser. 6. i. 290.

P. Douglasii, Gaud. Atl. Bon. t. xxii. f. 16; Walp. Ann. i. 752; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

P. fascicularis, Lam. Encyc. Bot. i. 372 (excl. β); Willd. Sp. Pl. iv. 646 (büschelfrüchtiger Pandanus); Pers. Synops. ii. 597; Dennst. Clav. Hort. Mal. 11; Spreng. Syst. Veg. iii. 897; Kth. En. Pl. iii. 98 (excl. syn. *Folium baggea maritimum*, Rumph.); Voigt Cat. Hort. Calc. 683.

P. leucacanthus, Hort.; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46.

P. leucanthus (*leucacanthus*?), Hasskl. in Flora (Bot. Zeit.) 1842, Beibl. ii. 14 (fid. Kurz).

P. Linnæi, Gaud. Atl. Bon. t. xxii. ff. 1–8; Walp. Ann. i. 752;

Wochenschr. ix. (1866) 142; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

Pandanus littoralis, *Jungh. Topogr. nat. Reisen d. Java 61 (fid. Krz.); Horsf. Geol. Bot. of Java 178; Miq. Flor. Ind. Bat. iii. 158.

P. Loureiri, Gaud. Atl. Bon. t. xxii. f. 13; Walp. Ann. i. 752; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

P. maritimus, *Rumph. (quoted Spreng. Syst. Veg. iii. 897, as syn. of *P. fascicularis*, Lam.).

P. Menziesii, Gaud. Atl. Bon. t. xxii. f. 14; Walp. Ann. i. 752; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

P. odoratissimus, var., Ad. Br. in Ann. Sc. Nat. ser. 6, i. 272.

P. odoratus, Rumph. Herb. Amb. iv. 140.

P. odoratus, Salisb. Prod. 3.

P. Rheedii, Gaud. Atl. Bon. t. xxii. f. 12; Walp. Ann. i. 752; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

P. Rumphii, Gaud. Atl. Bon. t. xxii. f. 11; Walp. Ann. i. 752; Ad. Br. Ann. Sc. Nat. ser. 6, i. 290.

P. spiralis, Blanco Fl. de Filip. 777 (fid. Miq.).

P. spiralis, R. Br. Prod. 341; Spreng. Syst. Veg. iii. 898; Kth. En. Pl. iii. 100; Steud. Nom. Bot. (2nd ed.) ii. 251; Voigt Cat. Hort. Calc. 683; Muell. Fragm. Phyt. Austr. v. 40.

P. spurius, Rumph. Herb. Amb. iv. 142, tt. lxxv. (excl. f. A.) lxxxi.; Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 52; id. in Natuurk. Tijdschr. v. Ned. Ind. xxvii. 218; id. in Seem. Journ. Bot. v. (1867) 129.

P. tectorius, Soland. Prim. Fl. Ins. Pacif. (ined.) 350; Parkins. Fij. Tahit. Pl. (ined.) t. 113.

P. verus, Rumph. Herb. Amb. iv. 139, t. lxxiv.?; Krz. in Seem. Journ. Bot. v. (1867) 125 (excl. syn. *P. Milleri*, Roxb.); id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149 (excl. syn. *P. fragrans*, Gaud.); id. in Flora (Bot. Zeit.) lii. (1869) 453 (excl. syn. *P. fragrans*, Gaud.); Seem. Flor. Vitiens. 281 (excl. syn. *P. Milleri*, Roxb.).

Hab. Indian archipelago; North Australia to Sandwich Islands.

Nom. vulg. "Pandang matti," "Pandang Nipa," or "Bou Bou" in Malay, "Keker ela" or "Kekel ela" in Amboina, "Tsjindaga" in Java, "Buro-buro" in Ternate, "Indang" in Banda, and "Kaldera" in Hindostan (*Rumph.*); "Kadi" or "Kabua Kadi" in Arabia (*Forsk.*); "Ewhaiha" in Tahiti (*Soland.*); "Faudren" in Madagascar (*Pet. Th.*); "Pandan passir" in Java (*Horsfield*); "Ketuka," "Keura," or "Kea" (*Roxb.*); "Keura-ka-khat" (*Graham*); "Pandan laut leutik" or "Pandan samak laut" (*Hasskl.*); "Pan" in New Caledonia (*Vieill.*); "Moodookaiyeya" in Ceylon (*Thwaites*); "Pandan laut" in Malay, "Sataphu" in Birma, and "Ledelet" in Andaman Islands (*Kurz*); "Balawa" or "Vadra" in Fiji (*Seem.*).

PANDANUS ODORATISSIMUS, *Lour. Flor. Cochin.* 603; *Krz. in Seem. Journ. Bot.* v. (1867) 130.

Hab. Cochin China.

Nom. vulg. "Cây Júa."

?If *P. odoratissimus*, L. fil.

P. odoratissimus, Noronh. Pl. Jav. in Verh. Bat. Genootsch. v. 83.
Cfr. P. lævis, Lour.

P. odoratus, Rumph. Herb. Amb. iv. 140.
Cfr. P. odoratissimus, *L. fil.*

P. odoratus, Rumph. Herb. Amb. iv. 146.
Cfr. P. amaryllifolius, *Roxb.*

P. odoratus, Salisb. Prodr. 3.
Cfr. P. odoratissimus, *L. fil.*

P. ORNATUS, *Hort.*; *Journ. Hort. Soc. Lond. Misc.* i. (1866); *Ill. Hort.* xix. (1872) 143, t. xcvii.

Hab. Rodriguez?

P. ORNATUS, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 147; *id. in Flora (Bot. Zeit.)* lii. (1869) 451 (excl. syn. Fisquetia militaris, *Gaud.*).

Fisquetia ornata, Gaud. Atl. Bon. t. v. ff. 1, 8, 9; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Malacca.

P. OVATUS, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 147; *id. in Flora (Bot. Zeit.)* lii. (1869) 450.

Fisquetia ovata, Gaud. Atl. Bon. t. iv. f. 1; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Malacca.

36. **P. palustris,** *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 6; *id. in *Desv. Journ. de Bot.* i. 48; *Lam. Encyc. Bot. Suppl.* i. 577 (Baquois des marais); *Spreng. Syst. Veg.* iii. 898; *Boj. Hort. Maur.* 301; *Kth. En. Pl.* iii. 96; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683; *Krz. in Seem. Journ. Bot.* v (1867) 133; *Balf. fil. in Baker Flor. Maur. Seych.* 402.

Roussinia indica, Gaud. Atl. Bon. t. xxi. ff. 5–9.

Hab. Mauritius.

Nom. vulg. "Vacoua."

37. **P. Pancheri.**

Barrotia Pancheri, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 284, t. xiv. f. 4.

Pandanus sphærocephalus, Panch. MSS. partim (fid. Ad. Br. *l.c.*).

Hab. New Caledonia.

P. PARASITICUS, *Noronh. Pl. Jav. in Verh. Bat. Genootsch.* v. 83.

Hab. Java.

Nom. vulg. "Burong-tandang."

38. **Pandanus pedunculatus,** *R. Br. Prod.* 341; *Spreng. Syst. Veg.* iii. 898; *Boj. Hort. Maur.* 302; *Kth. En. Pl.* iii. 100; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Voigt Cat. Hort. Calc.* 683; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47; *Vieill. in Ann. Sc. Nat.* ser. 4, xvi. 151; *Muell. Fragm. Phyt. Austr.* v. 40, viii. 220, ix. 193; *Krz. in Seem. Journ. Bot.* v. (1867) 130; *Benth. Flor. Austr.* vii. 149.

Hab. Tropical Australia.

Nom. vulg. "Vacoua de la Nouvelle Hollande" in Mauritius (*Bojer*).

P. Pervilleanus, Krz. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149. *Cfr. P. Boucheanus,* C. Koch.

39. **P. polycephalus,** *Lam. Encyc. Bot.* i. 372 (Baquois à plusieurs têtes); *id. Suppl.* i. 575 (excl. P. humilis, *Jacq.*); *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47; *Wall. Cat.* 8588.

Pandanus humilis, Rumph. Herb. Amb. iv. 143. t. lxxvi.; Willd. Spec. Pl. iv. 645 (excl. syn. Jacq. et hab. ins. Maur.) (kleiner Pandanus); Pers. Synop. ii. 597 (excl. syn. Jacq.); Spreng. Syst. Veg. iii. 898 (excl. syn. *P. pygmæus,* Pet. Th. et hab. ins. Masc. Madagascar); Desf. Cat. Hort. Reg. Par. 9 (excl. syn. Jacq.); Boj. Hort. Maur. 302 (excl. syn.); Kth. En. Pl. iii. 99 (excl. syn. Jacq. et *P. montanus,* Bory); Steud. Nom. Bot. (2nd ed.) ii. 251 (excl. syn. *P. montanus,* Bory); Hassk. in Flora (Bot. Zeit.) 1842, Beibl. ii. 13; id. Cat. Bog. 60; Voigt Cat. Hort. Calc. 683; Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 46?; Miq. Flor. Ind. Bat. iii. 160 (excl. syn. Jacq.); Thw. En. Pl. Zeyl. 327?; Krz. in Miq. Ann. Mus. Lugd.-Bat. ii. 53; id. in Natuurk. Tijdschr. v. Ned. Ind. xxvii. 219; id. in Seem. Journ. Bot. (1867) 105, t. lxiii. (excl. syn. Jacq., *P. montanus,* Bory, *P. pygmæus,* Hook., et distrib. Bourbon); id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 150 (excl. syn.); id. in Flora (Bot. Zeit.) lii. (1869) ii. 3. 454 (excl. syn.).

? *P. humilis,* Lour. Flor. Cochinch. 603 (excl. syn. *Kaida-taddi,* Reede).

P. latifolius, Loud.; Steud. Nom. Bot. (2nd ed.) ii. 251 (fid. Spreng.).

Hab. Eastern archipelago.

Nom. vulg. "Pandang kitsjil" in Malay, "Keker" or "Kekel leynulun" in Amboina, "Berel" in Leytimor, and "Deuro" or "Panrang" in Macassar (*Rumph.*); "Pandan serengseng," "Harassus lentik" or "Harassus lumboet" (*Hasskl.*); "Doonoo-kaiyeya" in Ceylon (*Thwaites*); "Sarengseng besár" and "Ketorykat" in Bangka (*Kurz*).

P. POLYRYZOS, *Pet. Th. Prod. Phyt. in Mélang.*

Hab. Madagascar.

Nom. vulg. "Siric."

PANDANUS PORTEANUS, *Hort.*; *Hortic. Franç.* (1866) 16. t. i.
Hab. Philippines.

P. PRINCEPS, *Hort.*
Hab. ——

P. PROLIFERUS, *Hort.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47.
Hab. ——

40. **P. prostratus,** *Balf. fil.*

P. conoideus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 5; id. in *Desv. Journ. de Bot. i. 47; Lam. Encyc. Bot. Suppl. i. 577 (Baquois conique); Kth. En. Pl. iii. 97; Steud. Nom. Bot. (2nd ed.) ii. 251 (hab. emend.); Krz. in Seem. Journ. Bot. v. (1867) 130; Krz. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 150 (excl. syn.) id. in Flora (Bot. Zeit.) lii. (1869) 454 (excl. syn.); Balf. fil. in Baker Flor. Maur. Seych. 398.

Hab. Mauritius.
Nom. vulg. "Vacoa marron."

41. **P. purpurascens,** *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 3; *id. in *Desv. Journ. de Bot.* i. 44; *Lam. Encyc. Bot. Suppl.* i. 576 (Baquois à semences purpurines); *Spreng. Syst. Veg.* iii. 898; *Boj. Hort. Maur.* 302 (hab. excl.); *Kth. En. Pl.* iii. 97 (hab. excl.); *Steud. Nom. Bot.* (2nd ed.) ii. 250; *Krz. in Seem. Journ. Bot.* v. (1867) 133 (hab. excl.).

Vinsonia drupacea, Gaud. Atl. Bon. t. xxx. ff. 8–11; Walp. Ann. i. 756; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

V. purpurascens, Gaud. Atl. Bon. t. xviii. ff. 6–9; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

Hab. Ile de la Réunion.

P. pygmæus, Hook. Bot. Mag. t. 4736.
Cfr. P. pygmæus, *Pet. Th.*

P. pygmæus, Hort. is *Freycinetia leucacantha,* Miq. Flor. Ind. Bat. iii. 172 (fid. Miq.).

42. **P. pygmæus,** *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 6; *id. in *Desv. Journ. de Bot.* i. 46; *Lam. Encyc. Bot. Suppl.* i. 577 (Baquois pygmée); *Kth. En. Pl.* iii. 99; *Steud. Nom. Bot.* (2nd ed.) ii. 251 (excl. syn.); *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47 (excl. syn. P. graminifolius, Freycinetia graminifolia, *and* F. leucacantha); *Krz. in Seem. Journ. Bot.* v. (1867) 131.

? *Fouillioya graminifolia,* Hort. (fid. Wendl.).

Pandanus pygmæus, Hook. Bot. Mag. t. 4736; *Allgem. Gartenz. (1853) 311; Gartenfl. ii. (1853) 341; Walp. Ann. v. 857.

Hab. Madagascar.
Nom. vulg. "Vacoua nain."

43. **Pandanus pyramidalis,** *Barkly MSS.*; *Balf. fil. in Baker Flor. Maur. Seych.* 399.

P. striatus, Carm. MSS.

Hab. Mauritius.

P. pyramidatus, Carm. MSS.

Cfr. P. montanus, *Bory.*

P. RACEMOSUS, *Krz. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 150 (excl. syn. Fouillioya maritima, *Gaud.*); *id. in Flora* (*Bot. Zeit.*) lii. (1869) 454 (excl. syn. Fouillioya maritima, *Gaud.*).

Fouillioya racemosa, Gaud. Atl. Bon. t. xxvi. ff. 1–9; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. ——

P. RADICANS, *Blanco Fl. de Filip.* 780; *Kth. En. Pl.* iii. 584; *Miq. Flor. Ind. Bat.* iii. 166; *Krz. in Seem. Journ. Bot.* v. (1867) 130.

Hab. Philippines.

Nom. vulg. "Olango."

P. REFLEXUS, *Hort.*; *Desf. Cat. Hort. Reg. Par.* 9; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47; *Koch in Wochenschr.* (1858) 132; *Krz. in Seem. Journ. Bot.* v. (1867) 133.

Doornia reflexa, De Vriese in Kew Gard. Misc. vi. 266; id. in Tuinbouw Flora i. 174; id. in Linnæa xxvi. 763; id. in Flor. des Jard. des Pays-Bas i. (1858) 23; Walp. Ann. v. 858.

Hab. Mascarene Islands?

? If *P. conglomeratus,* Balf. fil., is this species.

P. repens, Rumph. Herb. Amb. iv. 152.

Cfr. P. Samak, *Hasskl.*

P. RETICULATUS, *Vieill. in Ann. Sc. Nat.* ser. 4, xvi. 52.

Hab. New Caledonia.

P. Rheedii, Gaud. Atl. Bon. t. xxii. f. 12.

Cfr. P. odoratissimus, *L. fil.*

P. Rumphii, Gaud. Atl. Bon. t. xxii. f. 11.

Cfr. P. odoratissimus, *L. fil.*

P. SABOTAN, *Blanco Fl. de Filip.* 779; *Kth. En. Pl.* iii. 584; *Miq. Fl. Ind. Bat.* iii. 166.

Hab. Philippines.

Nom. vulg. "Sabotan."

44. **P. Samak,** *Hassk. in Flora* (*Bot. Zeit.*) 1842, *Beibl.* ii. 13; *id. Cat. Bog.* 61; *Walp. Ann.* i. 753; *Miq. Flor. Ind. Bat.* iii. 165; *Krz. in Natuurk. Tijdschr. v. Ned. Ind.* xxvii. 218; *id. in Miq. Ann. Mus. Lugd.-Bat.* ii. 54.

P. repens, Rumph. Herb. Amb. iv. 152; Miq. Flor. Ind. Bat. iii. 165; Krz. in Seem. Journ. Bot. v. (1867) 128.

Pandanus variegatus, Miq. Anal. Bot. Ind. ii. 16; id. in. Flor. Ind. Bat. iii. 165.

Hab. Indian archipelago.

Nom. vulg. "Cocoja" in Malay, "Leut" in Amboina, and "Rune" in Ceram (*Rumph.*); "Pandan samak" or "tikker" (*Hasskl.*).

P. sativus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 3.

Cfr. P. utilis, *Bory.*

45. **Pandanus Sechellarum,** *Balf. fil. in Baker Flor. Maur. Seych.* 402.

Hab. Seychelles.

Nom. vulg. "Vacoa marron."

P. SESSILIS, *Boj. Hort. Maur.* 302; *Steud. Nom. Bot.* (2nd ed.) ii. 251 (hab. excl.).

Hab. Tropical Africa; Zanzibar; Pemba.

P. SESSILIS, *Hort.*; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47.

P. glaucus, Hort. (fid. Wendl.).

Hab. Australia.

P. sphærocephalus, *Panch. MSS. partim.

Cfr. P. Pancheri.

46. **P. sphærocephalus,** **Panch. MSS. partim.*

Barrotia sphærocephala, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 284, t. xv. f. 7.

Hab. New Caledonia.

47. **P. sphæroideus,** *Pet. Th. in Bull. Sc. Soc. Phil. Paris* (août 1808) 5; *id. in *Desv. Journ. de Bot.* i. 46; *Lam. Encyc. Bot. Suppl.* i. 577 (Baquois sphéroïde ou globuleux); *Kth. En. Pl.* iii. 97; *Steud. Nom. Bot.* (2nd ed.) ii. 251; *Krz. in Seem. Journ. Bot.* v. (1867) 130; *Balf. fil. in Baker Flor. Maur. Seych.* 396.

P. globuliferus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 5; id in *Desv. Journ. de Bot. i. 47; Lam. Encyc. Bot. Suppl. i. 577; Spreng. Syst. Veg. iii. 898; Boj. Hort. Maur. 301; Kth. En. Pl. iii. 97; Steud. Nom. Bot. (2nd ed.) ii. 251 (*globiferus*); Krz. in Seem. Journ. Bot. v. (1867) 131.

Hab. Mauritius.

P. spinifructus (*spinifractus,* Krz.), Dennst. Clav. Hort. Mal. 11.

Cfr. P. furcatus, *Roxb.*

P. spiralis, Blanco Fl. de Filip. 777.

Cfr. P. odoratissimus, *L. fil.*

P. spiralis, Hort. (non R. Br.); Oudem. in Flor. des Jard. des Pays-Bas, v. 81.

Cfr. P. utilis, *Bory.*

PANDANUS SPIRALIS, *Miq. in Tuinbouw Flora (fid. Kurz)?
Hab. Australia.

P. spiralis, R. Br. Prod. 341.
Cfr. P. odoratissimus, *L. fil.*

P. spurius, Hort.
Cfr. P. utilis, *Bory.*

P. spurius, Miq. Anat. Bot. Ind. ii. 15 (non Rumph.).
Cfr. P. utilis, *Bory.*

P. spurius, Rumph. Herb. Amb. iv. 142, tt. lxxv. (excl. fig. A), lxxxi.
Cfr. P. odoratissimus, *L. fil.*

48. **P. stenophyllus,** *Kurz, in Miq. Ann. Mus. Lugd.-Bat.* ii. 53.
Freycinetia nitida, Miq. Ind. Sem. Hort. Amst. 1853, 4; id. Flor. Ind. Bat. iii. 172.
Pandanus nitidus, Krz. in Seem. Journ. Bot. v. (1867) 103; id. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 146; id. in Flora (Bot. Zeit.) lii. (1869) 451.
Hab. Java.
Nom. vulg. "Soeng riengung."

P. striatus, Carm. MSS.
Cfr. P. pyramidalis, *Barkly.*

P. strigilis, Carm. MSS.
Cfr. P. drupaceus, *Pet. Th.*

P. SUSSEA.
Sussea microcarpa, Gaud. Atl. Bon. t. xxv. ff. 8–10.
Hab. ——
? If *P. littoralis,* Krz.

49. **P. sylvestris,** *Bory Voy.* ii. 260 (Vacoi sylvestre).
P. elegans, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 4; id. in *Desv. Journ. de Bot. i. 46; Lam. Encyc. Bot. Suppl. i. 576 (Baquois élégant); Spreng. Syst. Veg. iii. 898; Boj. Hort. Maur. 302 (excl. hab. Maur.); Kth. En. Pl. iii. 96; Steud. Nom. Bot. (2nd ed.) ii. 251; Voigt Cat. Hort. Calc. 683; Krz. in Seem. Journ. Bot. v. (1867) 133.
P. humilis, Jacq. Fragm. Bot. 21, t. xiv. f. 2; Trans. Hort. Soc. Lond. i. 265 (excl. syn.); *Allgem. Teutsch. Gart. Mag. (1823) 157.
P. lucidus, Wall.; Krz. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149; id. in Flora (Bot. Zeit.) lii. (1869) 453.
P. utilis β. lucidus, Krz. in Seem. Journ. Bot. v. (1867) 131.
Vinsonia elegans, Gaud. Atl. Bon. t. xvii. ff. 12, 13; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.
V. humilis, Gaud. Atl. Bon. t. xvii. ff. 10, 11; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

Vinsonia lucida, Gaud. Atl. Bon. t. xvii. ff. 14, 15; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290.

Hab. Ile de la Réunion.

PANDANUS SYLVESTRIS, *Hort.; Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47.

P. mauritianus, Hort. Berol. et Ins. pav. Potsd. (fid. Wendl.).

P. odoratissimus, Hort. (fid. Wendl.).

Hab. ——

P. sylvestris, Krz. in Journ. Asiat. Soc. Beng. xxxviii. (1869) ii. 3. 149.

Cfr. P. Barklyi, *Balf. fil.*

P. sylvestris, Rumph. Herb. Amb. iv. 145, t. lxxvii.

Cfr. P. atrocarpus, *Griff.*

P. tectorius, Soland. Prim. Fl. Ins. Pacif. (ined.) 350.

Cfr. P. odoratissimus, *L. fil.*

50. **P. tenuifolius,** *Balf. fil. in Baker Flor. Maur. Seych.* 400.

Hab. Rodriguez.

Nom. vulg. "Vacoa chevron."

P. TENUIFOLIUS, *Lind. Ill. Hort.* xx. (1873) 70.

Hab. ——

P. terrestris, Rumph. Herb. Amb. iv. 145.

Cfr. P. atrocarpus, *Griff.*

P. TETRODON.

Barrotia Gaudichaudi, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 264.

B. tetrodon, Gaud. Atl. Bon. t. xiii. ff. 1–8; Walp. Ann. i. 754; Ad. Br. in Ann. Sc. Nat. ser. 6. i. 291.

Hab. ——

? If *P. dubius,* Spreng.

P. TURBINATUS, *Hort.; Steud. Nom. Bot.* (2nd ed.) ii. 251.

Hab. Ind. Or.

P. UNIPAPILLATUS, *Dennst. Clav. Hort. Mal.* 15; *Steud. Nom. Bot.* (2nd. ed.) ii. 251; *Krz. in Seem. Journ. Bot.* v. (1867) 128.

Perin kaida taddi, Reede Hort. Mal. ii. t. vii.

Hab. Malabar.

P. urophyllus, Hance in Trim. Journ. Bot. iv. 68.

Cf. P. furcatus, *Roxb.*

51. **P. utilis,** *Bory, Voy.* ii. 3; *Desf. Tabl. Mus. Par.* 249; *id. Cat. Hort. Reg. Par.* 9; **Willd. En. Dietr. Lex. Nachtrag,* v. 503; *Dict. Sc. Nat. Atlas* ii. tt. 10, 11; *Spreng. Syst. Veg.* iii. 897; *Boj. Hort. Maur.* 301; *Kth. En. Pl.* iii. 96; *Steud. Nom. Bot.* (2nd ed.) ii. 252; *Voigt Cat. Hort. Calc.* 683; *Wendl. Ind. Palm. Cyclanth. Pand. Cycad.* (1854) 47; *Miq. Flor. Ind. Bat.* iii. 159; *Ill. Hort.* vii. (1860) fig. c. t. 265; *Hamb. Gartenz.* xvii. (1861) 498; *Krz. in Miq. Ann. Mus.*

Lugd.-Bat. ii. 52; *id. in Seem. Journ. Bot.* v. (1867) 131, tt. lxiv. ff. 3–4, lxv. (excl. β. *lucida*); *id. in Journ. Asiat. Soc. Beng.* xxxviii. (1869) ii. 3. 149 (excl. aliq. syn.); *id. in Flora* (*Bot. Zeit.*) lii. (1869) 453 (excl. aliq. syn.); *Gartenfl.* xxii. (1873) 48, c. ic. xyl.; *Balf. fil. in Baker Flor. Maur. Seych.* 398. Var. distichus, *Hort.*; *Hortic. Franç.* 1866, 232, t. viii.; *Ann. Soc. d'Hort. Par.* 1866, 118.

Hasskarlia globosa, Walp. Ann. i. 753 (excl. syn. et hab.).

Marquartia globosa, Hassk. in Flora (Bot. Zeit.) 1842, Beibl. ii. 14; id. Cat. Boj. 61 (excl. syn.); Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 45 (excl. syn. *P. spurius*, Rumph.).

Pandanus Candelabrum, Hook. Bot. Mag. t. 5014 (excl. syn.); Gartenflora vii. (1858) 118; Journ. Soc. Imp. et Centr. d'Hort. Franç. iv. (1858) 68; *Journ. d'hort. de la Belg. i. 267.

P. distichus, Hort.; Ill. Hort. xix. (1872) 55.

P. elegantissimus, Hort.; Proc. Roy. Hort. Soc. iii. (1863) 108, 280; Hamb. Gartenz. xix. (1863) 391; Gartenflora xiii. (1864) 153. Var. *latifolius,* Hort.

P. flabelliformis (*flagelliformis*), E. Carr. Rev. Hort. 1866, 271. c. ic. col.; Gartenfl. xv. (1866) 269.

P. maritimus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 4; id. in *Desv. Journ. de Bot. i. 45; Lam. Encyc. Bot. Suppl. i. 576 (Baquois maritime); Spreng. Syst. Veg. iii. 898; Boj. Hort. Maur. 302; Kth. En. Pl. iii. 96; Steud. Nom. Bot. (2nd ed.) ii. 251; Krz. in Seem. Journ. Bot. v. (1867) 132.

P. mauritianus (*mauritanus,* Krz.), Hort.; Ill. Hort. vii. (1860) t. 265; Gartenflora x. (1861) 427.

P. nudus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 4; id. in *Desv. Journ. de Bot. i. 45; Lam. Encyc. Bot. Suppl. i. 578; Kth. En. Pl. iii. 96.

P. odoratissimus, Hort.; Ann. de la Soc. d'Hort. de Paris 39. 125; Revue Hortic. vii. 366.

P. odoratissimus, Jacq. Fragm. Bot. 21, tt. xiii, xiv. f. 1; Descourt. Antill. viii. 37, t. 540.

P. sativus, Pet. Th. in Bull. Sc. Soc. Phil. Paris (août 1808) 3; id. in *Desv. Journ. de Bot. i. 44; Lam. Encyc. Bot. Suppl. i. 576 (Baquois cultivé); Steud. Nom. Bot. (2nd ed.) ii. 251.

P. spiralis, Hort. (non R. Br.); Wendl. Ind. Palm. Cyclanth. Pand. Cycad. (1854) 47; Flor. des Jard. des Pays-Bas v. (1862) 81. c. ic. A, B.

P. spurius, Hort.; fid. Wendl. l. c.

P. spurius, Miq. (non Rumph.) Anal. Bot. Ind. ii. 15; id. Flor. Ind. Bat. iii. 157; Kurz in Seem. Journ. of Bot. v. (1867) 131.

P. Vacqua, Carm. MSS.

P. Veitchii, Hort. ante 1868.

Vinsonia consanguinea, Gaud. MSS.
V. macrostigma, Gaud. MSS.
V. media, Gaud. MSS.
V. palustris, Gaud. Atl. Bon. t. xvii. ff. 18–23; Walp. Ann. i. 756; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.
V. propinqua, Gaud. MSS.
V. stephanocarpa, Gaud. Atl. Bon. t. xxiii. ff. 2–5, 7, 8; Walp. Ann. i. 756.
V. striata, Gaud. MSS.
V. Thouarsii, Gaud. MSS.
V. utilis, Gaud. Atl. Bon. tt. xvii. ff. 1–5, xxiii. ff. 1, 6, 9–18; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 290. Var. *stephanocarpa*, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Madagascar.

Nom. vulg. "Vacoa sac" in Ins. Masc.; "Pandan laut besaar" and "Pandan laut gedeh" (*Hasskl.*).

Pandanus utilis β. *lucidus*, Krz. in Seem. Journ. Bot. v. (1867) 131.
Cfr. P. sylvestris, *Bory*.

P. utilis, Hort. Amst. et Brux.
Cfr. P. odoratissimus, *Hort. Herrenh.* No. 1.

P. Vacqua, Carm. MSS.
Cfr. P. utilis, *Bory*.

52. **Pandanus Vandermeeschi**, *Balf. fil. in Baker Flor. Maur. Seych.* 398.
Fouillioya maritima, Gaud. Atl. Bon. t. xxvi. ff. 21–24; Walp. Ann. i. 755; Ad. Br. in Ann. Sc. Nat. ser. 6, i. 291.

Hab. Mauritius.

P. variegatus, Miq. Anal. Bot. Ind. ii. 16.
Cfr. P. Samak, *Hasskl.*

P. Veitchii, *Hort.*; *Gard. Year-Book* (1869) 91; *Flor. & Pom.* x. (1871) 177. c. ic. xyl.; *Hamb. Gartenz.* xxvii. (1871) 313; *Ill. Hort.* xix. (1872) 55. c. ic. xyl.; *Gartenfl.* xxii. (1873) 310. c. ic. xyl.; **Album Dallière* i. (1873) 28; *Journ. Soc. Centr. Hort. France* ser. 2, v. (1875) 26.

Hab. South-Sea Islands.

P. verus, Rumph. Herb. Amb. iv. 139, t. lxxiv.
Cfr. P. odoratissimus, *L. fil.*

53. **P. viscidus**, **Panch. in herb.*
Bryantia (*Lophostigma*) *viscida*, Ad. Br. in Ann. Sc. Nat. ser. 6, i. 287, t. xv. f. 9.

Hab. New Caledonia.

P. vittariifolius, *Boj. Hort. Maur.* 302.

Hab. Madagascar.

Nom. vulg. "Vacoua à feuilles en rubans."

Perin kaida-taddi, Reede Hort. Mal. ii. t. vii.
Cfr. Pandanus unipapillatus, *Dennst.*

Roussinia indica, Gaud. Atl. Bon. t. xxi.
Cfr. Pandanus Leram, *Jones*, & P. palustris, *Pet. Th.*

Gaudichaud has here confounded two species, and in his plate has copied figs. 1–4 from the drawings of *P. Leram*, Jones in 'Asiatic Researches,' iv. 164; and the other figures (5–9) are drawn from specimens of *P. palustris*, Pet. Th., now in the museum at Paris.

Ryckia furcata, De Vriese in Versl. kl. Akad. Wet. ii. (1854) 203.
Cfr. Pandanus furcatus, *Roxb.*

Sussea conoidea, Gaud. Atl. Bon. t. xxiv.
Cfr. Pandanus montanus, *Bory.*

S. lagenæformis, Gaud. Atl. Bon. t. xxv. ff. 11–14.
Cfr. Pandanus lagenæformis.

S. microcarpa, Gaud. Atl. Bon. t. xxv. ff. 8–10.
Cfr. Pandanus Sussea.

S. microstigma, Gaud. Atl. Bon. t. xxxviii.
Cfr. Pandanus microstigma.

Tuckeya Candelabrum, Gaud. Atl. Bon. t. xxvi. ff. 10–20.
Cfr. Pandanus Candelabrum, *Pal. Beauv.*

Vinsonia acuminata, Gaud. MSS.
Cfr. Pandanus acuminatus.

V. consanguinea, Gaud. MSS.
Cfr. Pandanus utilis, *Bory.*

V. drupacea, Gaud. Atl. Bon. t. xxxi. ff. 8–11.
Cfr. Pandanus purpurascens, *Pet. Th.*

V. elegans, Gaud. Atl. Bon. t. xvii. ff. 12, 13.
Cfr. Pandanus sylvestris, *Bory.*

V. humilis, Gaud. Atl. Bon. t. xvii. ff. 10, 11.
Cfr. Pandanus sylvestris, *Bory.*

V. lucida, Gaud. Atl. Bon. t. xvii. ff. 14, 15.
Cfr. Pandanus sylvestris, *Bory.*

V. macrostigma, Gaud. MSS.
Cfr. Pandanus utilis, *Bory.*

V. media, Gaud. MSS.
Cfr. Pandanus utilis, *Bory.*

V. palustris, Gaud. Atl. Bon. t. xvii. ff. 18–23.
Cfr. Pandanus utilis, *Bory.*

V. Pervilleana, Gaud. Atl. Bon. t. xxxi. ff. 1–7.
Cfr .Pandanus Boucheanus, *Koch.*

V. propinqua, Gaud. MSS.
Cfr. Pandanus utilis, *Bory.*

Vinsonia purpurascens, Gaud. Atl. Bon. t. xvii. ff. 6–9.
Cfr. Pandanus purpurascens, *Pet. Th.*

V. stephanocarpa, Gaud. Atl. Bon. t. xxiii. ff. 2–5, 7, 8.
Cfr. Pandanus utilis, *Bory.*

V. striata, Gaud. MSS.
Cfr. Pandanus utilis, *Bory.*

V. sylvestris, Gaud. Atl. Bon. t. xvii. ff. 16, 17.
Cfr. Pandanus Barklyi, *Balf. fil.*

V. Thouarsii, Gaud. MSS.
Cfr. Pandanus utilis, *Bory.*

V. utilis, Gaud. Atl. Bon. tt. xvii. ff. 1–5, xxiii. ff. 1–6, 9–18.
Cfr. Pandanus utilis, *Bory.*

POSTSCRIPT (April 1878).

Since the foregoing list was laid before the Society, Count Sohlms Laubach has published ('Linnæa' xlii. 1. February 1878) his "Monographia Pandanacearum." In it he describes many Eastern forms. I find that we differ in the identification of several species; but as a decision regarding them can only be arrived at when more satisfactory materials are obtained, I shall not at present criticise the memoir.

I may note here, however, that six new species are described. Of these, five I believe to be good; but I see no necessity for keeping up the sixth specific name. I append the names as a supplement to my list.

In the 'Botanical Magazine' for February 1878, under tab. 6347, Sir Joseph Hooker describes a new species, *Pandanus unguifer,* from Northern Bengal. I have little doubt this is *Pandanus minor,* Wall.

Pandanus Boivini, *Sohlms Laub. in Linnæa* xlii. (1878) 26.
Hab. Madagascar.

P. ceylanicus, *Sohlms Laub. in Linnæa* xlii. (1878) 16.
P. furcatus, Thw. En. Pl. Zeyl. 327.
Hab. Ceylon.
I placed Thwaites's plant in my list doubtfully under *P. furcatus,* Roxb.

P. Korthalsii, *Sohlms Laub. in Linnæa* xlii. (1878) 12.
Hab. Borneo.

P. Kurzianus, Sohlms Laub. in Linnæa xlii. (1878) 4.
I see no reason why this species should not be included under *Pandanus polycephalus,* Lam. It is the type of Gaudichaud's *Jeanneretia littoralis,* named by Kurz *Pandanus littoralis*; and these names, if Sohlms Laubach's identification be correct, will become synonyms of *Pandanus polycephalus,* Lam.

Pandanus Motleyanus, *Sohlms Laub. in Linnæa* xlii. (1878) 21.
Hab. Borneo.

Pandanus unguifer, Hook. fil. Bot. Mag. t. 6347.
Is *Pandanus minor*, Wall.

P. Yvanii, *Sohlms Laub. in Linnæa* xlii. (1878) 20.
Hab. Malacca.

On the *Schoepfieæ* and *Cervantesieæ*, distinct Tribes of the Styraceæ. By JOHN MIERS, F.R.S., F.L.S., &c., Dignit. and Commend. Ord. Imp. Bras. Rosæ.

[Read February 21, 1878.]

(PLATES I.–IV.)

THE first of these tribes may be distinguished by the following brief diagnosis:—

SCHOEPFIEÆ, tribus *Styracearum*. *Flores* calyculati. *Calyculus* parvus, margine inæqualiter divisus; *calyx* persimilis, calyculo inclusus, utraque facie liber, margine lacinulatus. *Ovarium, fructus* et *semen* ut in *Styrace*[1]. Genera 2.

1. *Schoepfia*: species 8, omnia Americanæ.
2. *Schoepfiopsis*: species 4, omnia Asiaticæ.

Schoepfia was established in 1789 by Schreber, who then gave an outline of its generic character, without reference to any species or to the country in which it originated[2]. Vahl, probably unaware of this fact, published in 1792[3] and 1794[4] an account of his *Codonium arborescens*, a plant evidently congeneric with Schreber's *Schoepfia*.

The opinions of botanists since that period have been singularly at variance in regard to its affinity, and not less in respect to the details of its structure; so that up to this time the genus has not found a satisfactory or permanent resting-place.

In 1794, Vahl (*loc. cit.*, sub *Codonium*) considered the genus should rest between *Caprifolium* and *Loranthus*.

[1] Contrib. Bot. i. p. 177, pls. 29, 30.
[2] Linn. Gen. Pl. edit. 8vo, p. 189, no. 323 (1789).
[3] Act. Soc. Hist. Nat. Hafniensis, xi. p. 208, tab. 6 (1792).
[4] Symbolæ, part iii. p. 36 (1794).

In 1808, Jussieu gave it the same position[1].

In 1824, Wallich regarded it as belonging to *Santalaceæ*[2].

In 1825, G. Don placed it in *Symplocaceæ*[3].

In 1830, Bartling referred it to *Ebenaceæ*[4].

In 1830, De Candolle placed it in *Loranthaceæ*, dividing it into two groups[5].

In 1839, Endlicher placed *Schoepfia* in *Symplocaceæ*[6]; but three years later he gave it another position.

In 1840, Bentham, remodelling the genus, fixed it in *Olacaceæ*[7].

In 1840, Spach located the genus among the *Symplocaceæ*[8].

In 1842, Endlicher removed *Schoepfia* into *Olacaceæ*[9].

In 1842, A. Richard placed the genus under *Diplocalyx*, in the *Sapotaceæ*[10].

In 1843, Meissner arranged *Schoepfia* in the *Styraceæ*, though it appeared to approach the *Myrsinaceæ*[11].

In 1849, Gardner and Champion placed it in the *Olacaceæ*[12].

In 1850, Blume thought the genus should be placed between the *Santalaceæ* and the *Loranthaceæ*, in a distinct order, the *Schoepfiaceæ*[13].

In 1856, Prof. De Candolle referred *Schoepfia* to the *Olacaceæ*, declaring that the structure of its ovary does not accord with the *Santalaceæ*[14].

In 1862, Baillon arranged the genus in the *Santalaceæ*[15].

In regard to my own first conclusion in 1845[16], and in 1851[17], when I had not seen the flower or fruit of *Schoepfia*, I accepted the decision of Mr. Bentham, the highest authority on the subject, and thus included the genus in the *Olacaceæ*.

But subsequently, on examining with care the structure of the genus, especially its ovary and fruit, I became convinced that

[1] Ann. Mus. xii. p. 300.
[2] In his edition of Roxb. Fl. Indica, ii. p. 190.
[3] Flor. Nepal. p. 145.
[4] Ord. Nat. Plant. sec. Sprengel nom. p. 534.
[5] Prodr. iv. p. 319.
[6] Gen. Pl. i. p. 744, No. 4260.
[7] Linn. Trans. xviii. p. 678.
[8] Phanerog. ix. p. 417.
[9] Gen. Suppl. ii. pp. 68, 83.
[10] Ramon de la Sagra, Hist. Nat. Plant. Cub. ii. p. 81; Bot. A. Richard, i.
[11] Plant. Vascul. Gen. sec. Steudel Nomenc. p. 534.
[12] In Hook. Journ. Kew, i. p. 308.
[13] Mus. Lugd.-Bat. i. p. 175.
[14] Prodr. xiv. p. 622.
[15] Adansonia, iii. p. 117.
[16] In 'Lindl. Veg. Kingd.' p. 444 *a*.
[17] Ann. Nat. Hist. 2 ser. viii. p. 105; Contrib. i. p. 17.

Schoepfia cannot belong to the *Olacaceæ*, because it does not present the filiform free central placenta rising in the axis of a unilocular ovary quite smooth within, to which it may be added, the circumstance that its seed is not destitute of all integumental coverings—conditions essential in the *Olacaceæ*; hence the necessity of its exclusion from that family.

At the same time I cannot accord in the determination that *Schoepfia* belongs to the *Santalaceæ*. The most valid argument against this conclusion is that the calyx and corolla are not combined into a simple perigonium partly connate with the ovarium —essential conditions of that order [1].

The following is an amended diagnosis of the genus from my own point of view.

SCHOEPFIA, *Schreber*.—Codonium, *Vahl*.—Hænkea, *R. & P.*—Diplocalyx, *A. Rich.*

Calyculus parvus, breviter crateriformis, margine inæqualiter divisus, liber; *calyx* ei persimilis, sessilis, utraque facie liber, margine inæqualiter 3–5-laciniulatus. *Corolla* tubulosa; *tubus* late cylindricus, imo sulcato-quinquangularis et hinc ad ovarium arcte agglutinatus, superne 5-fidus; *segmenta* oblonga, acutata, apice subreflexa, intus infra medium macula niveo-furfurosa prædita, in æstivatione marginibus angustissime introflexis. *Stamina* 5, segmentis opposita; *filamenta* anguste linearia, antice carinata, e margine disci orta, imo laxe affixa, superne libera, erecta, glabra: *antheræ* ovatæ, 2-lobæ, lobis oblique lateralibus ad *connectivum* crassiusculum dorso adglutinatis, longitudinaliter dehiscentibus. *Discus* magnus, epigynus, semiglobosus, alte pulvinatus, 4–5-sulcatus, spongiosus [2], intus vacuus, demum marcidus et complanatus. *Ovarium* ovato-turbinatum, a medio semi-triloculare, septorum marginibus oblique adscendentibus, in placentæ summo confluentibus et alas totidem simulantibus, apice hujus modo 1-loculare: *placenta* centralis, libera, a stylo disjuncta, apice truncata, modo indicato 3-alata; *ovula* sæpius 3 inter alas singulatim suspensa, plerumque exinde abortiva. *Stylus* perbrevis; *stigma* subcapitatum. *Fructus* ovatus, calyce suffultus: *pericarpium* carnosulum, rugosum, nigrescens, portione corollæ adnatæ auctum, circa apicem linea circulari ad corollæ circumscissionem, et disco emarcido complanato superatum; *mesocarpium* nux pallide testaceum, fragile; *endocarpium* membranaceum, ad nucem adhærens, pro dimidia parte infera modo indicato semi-3-loculare. *Semen* solitarium (alteris abortivis) ovatum, apice

[1] See my remarks on this point in Lindley's 'Veg. Kingd.' p. 444.

[2] "Porosus" (Schreb.); "fungosus" (R. & P.).

suspensum; *integumentum* crassiusculum, rugulosum; *cætera* non satis nota[1].

Arbusculæ aut suffrutices, *in America tropica vigentes*; rami *plerunque glabri*; folia *alterna, elliptica, petiolata*; pedunculi *axillares, pauci usque multiflori*; flores *minores, calyculati.*

From these characters it will be seen that *Schoepfia* differs from most of the genera of the *Styraceæ* in having a distinct calycle around a free small calyx, in having isomerous stamens opposite to the segments of the corolla, and differently formed anthers; it has also much smaller flowers and a dissimilar habit; but it accords in the main carpological features characteristic of the *Styraceæ.*

1. SCHOEPFIA ARBORESCENS, *R. & Sch. Syst.* v. p. 160; *Lam. Dict.* vi. p. 732; *DC. Prodr.* iv. p. 319, xiv. p. 622 (in nota).—Codonium arborescens, *Vahl in Act. Soc. Hist. Nat. Hafn.* ii. p. 206, tab. 6; *Symb.* fasc. iii. p. 36.—Schopfia Schreberi, *Lam. Illust.* ii. p. 51.—Schoepfia americana, *Willd. Sp. Pl.* i. p. 996. In Antillis: *v. s. in herb. Hook.* Jamaica (*Purdie*), Antigua (*Nicholson* 95), Dominica (*Imray* 204).

A fragrant shrub 8–10 feet high; branches terete, glabrous, with axils 4–6 lines apart; leaves ovate-oblong, suddenly narrowed at the base upon the petiole, obtusely acuminate, entire, glabrous, sometimes plicately falcate, pale green above, paler beneath, with prominulent midrib and immersed fine nerves, with reticulated veins, 1–2½ in. long, 1–1¼ in. broad, on sulcate petioles 3 lines long; inflorescence very short, solitary or geminate in the axils; peduncle ¾ line long, bearing 7 flowers on pedicels 1–2 lines long; calycle and calyx free, unequally 5-cleft, ciliate, 1 line long; corolla altogether 2½ lines long, tube urceolate, adhering at its base to the ovary, free above, broadish cylindrical, half-cleft into 5 oblong reflexed segments; stamens 5, opposite to and shorter than the segments; style 3-sulcate; stigma capitately 3-lobed; disk epigynous, elevated into a large pulvinate body which is fungous and hollow within; ovary half trilocular at the base, unilocular above, cell extending within the disk; placenta central,

[1] I met with only one immature seed, covered by a rugose thick integument, where the albumen was not yet developed. De Candolle (Prodr. iv. 319) describes also a single seed with the albumen and embryo perfected; but this probably refers to Wallich's description and figure of the Asiatic species.

free, sub-3-alate, bearing at its apex 3 suspended ovules; fruit and seed as in the following species.

2. Schoepfia flexuosa, *R. & Sch.* v. p. 160; *DC. Prodr.* iv. p. 319.—Hænkea flexuosa, *R. & P. Flor. Per.* iii. p. 8, tab. 231. In Andibus Peruviæ: *v. s. in herb. Hook.* Chachapoyas (*Mathews* 3005, in flore et fructu).

A branching shrub 6 feet high, with spreading, flexuous, subangular branchlets 6 in. long, having axils $\frac{1}{2}$–1 in. apart; leaves alternate, ovate-lanceolate, broader towards the subacute base, acuminate, margins subundulate, coriaceous, with immersed nerves, $2\frac{1}{2}$–$3\frac{1}{2}$ in. long, 1–$1\frac{1}{4}$ in. broad, on sulcate petioles 2 lines long; racemes 1 or 2 in each axil, on a peduncle 4 lines long bearing above 5 to 7 flowers on alternate pedicels 1 line long, supported by a minute deciduous acute bract; calycle and calyx unequally 5-toothed, ciliate, $\frac{3}{4}$ line long and broad, persistent, free; corolla urceolate, yellowish; tube adhering for half its length to the ovary, broadly cylindrical above, where it is half-cleft into 5 subacute reflexed segments which are subimbricate, or rather narrowly introflexed in æstivation; stamens 5, opposite to the segments and shorter than them; filaments slender, compressed, inserted in a pilose ring on the margin of the disk; anthers subglobose, the 2 distinct cells sublateral, dehiscing longitudinally on one side; disk epigynous, raised in the middle into a large, pulvinate, fungous gland, hollow inside; style shortish, bearing 3 small roundish stigmata; ovary ovate, $1\frac{1}{2}$ line long, superior with respect to the free calyx, inferior in regard to the free portion of the corolla, surmounted by the disk, trilocular below for half its length, unilocular above, with a narrowly 3-winged, stoutish, free central placenta, bearing at its obtuse summit 3 oblong pendulous ovules; drupe oval, 4 lines long, 3 lines broad, of a fuscous-grey colour, its summit marked by the flattened dried disk; pericarp thin, dry; nut thinly testaceous, 1-locular, lined with the adpressed placenta and dissepiments; seeds 3 or solitary, scarcely filling the nut, ovate, with a membranaceous integument; embryo (in albumen) not seen.

Ruiz and Pavon's description of the fruit and seed nearly accords with my own analysis, except that in their drawing the nut and its dissepiments are much too thick. According to Römer and Schultz, the fruit and seed bear some resemblance to that of *Rhysospermum nervosum*, Gaertn. tab. 224.

3. Schoepfia mexicana, *A. DC. Prodr.* xiv. p. 622. In Mexico: *v. s. in herb. Hook.* Oaxaca (*Andrieux* 345); Xalapa (*Galeotti*); Mexico (*Parkinson*, sub nom. *S. parvifolia* Planchon MS.).

A shrub with rugose branches and branchlets, becoming black in drying: leaves ovate or ovate-elliptic, somewhat acute at the base, obtusely acuminate, entire, rigidly chartaceous, fuscous-green above, opaque, with immersed fine nerves, paler beneath, with scarcely prominulent midrib and nerves, subapproximate, 10–15 lines long, 5–8 lines broad, on petioles 1-2 lines long; peduncles solitary or geminate in the axils, 2–3 lines long, bearing above 3 flowers on pedicels scarcely 1 line long; calyx 1 line long and broad, unequally 5-cleft, the teeth ciliate; corolla urceolate; tube 3 lines long, agglutinated for half its length to the ovary, the upper half broadly cylindrical, nearly 2 lines long, half-cleft into 5 oblong recurving segments; stamens 5, opposite to the segments, inserted on a pilose ring on the margin of the disk; anthers ovoid, of 2 laterally conjoined cells; disk epigynous, very large, fungous, hollow, surmounting the ovary, which is ovoid, 3-locular at the base for half its length, the septa extending into 3 narrow wings upon the stoutish, free, central placenta truncated at its summit, and there bearing 3 oblong suspended ovules.

4. S. brasiliensis, *A. DC. Prodr.* xiv. p. 622 (in nota).—S. nigricans, *Turcz. Bull. Soc. Hist. Nat. Moscou*, tom. xxxi. p. 249 (1858). In prov. Bahia ad Igreja velha (*Blanchet*, 3360 v. 3660): *non vidi.*

Its ligneous tortuous branches are covered by a whitish bark, the young branchlets and leaves becoming black in drying; leaves alternate, lanceolate-elliptic, gradually narrowing at the base upon the petiole, obtusely acuminate, oblique and inequilateral, entire, punctulate, with opposite divergent nerves, sides often folded together, coriaceous, 1 in. long, 6–8 lines broad, on a petiole 2 lines long; racemes axillary, short, on a flattened peduncle, solitary, geminate, or ternate, each bearing 3 sessile aggregated flowers 2 lines long; calycle and calyx ½ line long, subpuberulous, unequally 5-fid; corolla urceolate, half-cleft into 5 somewhat spreading segments; structure of the ovary as in *S. mexicana*.

5. S. obliquifolia, *Turcz. Bull. Soc. Hist. Moscou*, tom. xxxi. p. 249 (1858); *Benth. Linn. Trans.* xviii. 678. In Brasilia, Serra

de Jacobina, Bahia (*Moricand* 2593): *v. s. in herb. Hook.* (sub *S. confertiflora*, var., Planchon).

Branches stoutish, very pallid, smooth; branchlets slender, terete, substriate; leaves alternate, oblong-elliptic, acute at both ends, subinequilateral, entire, glabrous, with about six pairs of slender divergent nerves, $2\frac{3}{8}$–$2\frac{1}{2}$ in. long, 1–$1\frac{3}{8}$ in. broad, on sulcate petioles 2 lines long, all blackish in drying; peduncles lateral, compressed, puberulous, 2 lines long, bearing above 3–5 sessile flowers $2\frac{3}{4}$ lines long; calyx $\frac{1}{2}$ line long and broad, subpuberulous, 5-toothed; corolla rubidulous, tube adnate at the base to the ovary for half its length; segments 5, subacute, subrevolute; stamens 5, opposite to the segments, seated on the margin of the disk, on a fasciculated pilose ring.

6. SCHOEPFIA QUINTUPLINERVIS, *Turcz. in Bull. Soc. Hist. Nat. Moscou*, tom. xxxi. p. 248 (1858). In Brasilia, Bahia in sabulosis: *v. s. in herb. Hook.* Bahia (*Salzm.*, sub *S. confertiflora* Planch. MS.).

Branches geniculately dichotomous, terete, glabrous, with axils $\frac{1}{2}$ in. apart; leaves broadly ovate, rounded at the base, obtusely acute at the apex, entire, glabrous, many-nerved, the 5 lower pairs springing from the petioles, the more lateral 5 pairs alternately divergent, slender and subimmersed, $1\frac{1}{4}$–$1\frac{3}{4}$ in. long, $\frac{7}{8}$–$1\frac{1}{8}$ in. broad, on channelled petioles 2 lines long; inflorescence axillary, solitary or geminate, formed of very numerous flowers congested in an oval head, consisting of many close clusters of 3–4 small, oval, sessile buds; calycle and calyx free, very short, 5-cleft; corolla red; tube adnate at its base to the ovary, above urceolate, free, divided into 5 subspreading segments; stamens 5, shorter than the segments and opposite to them; filaments seated on the margin of the disk; ovary and epigynous disk as in *S. mexicana*.

7. S. GRANDIFOLIA, *Baillon, Adans.* iii. p. 117. In Bahia (*Blanchet* 2088): *non vidi.*

Prof. Baillon placed this in a separate section, *Choristigma*, hardly tenable, its difference consisting in a further abbreviation of the style, which is always short; this only amounts to a specific variation. Its alternate leaves are broadly ovate and rounded at the base, narrowed at the summit into a sublanceolate acumen, entire, glabrous, submembranaceous, penninerved, midrib and nerves prominulent beneath, the dimensions not given; racemes axillary, shorter than the petioles; calyx 5-cleft, lobes alternating

with the segments of the corolla; corolla tubular; tube adnate at its base to the ovary, cleft above into 5 segments; stamens nearly as long as the latter, filaments inserted on the margin of the disk; stigmata 4, small, on the summit of the ovary.

8. SCHOEPFIA CHRYSOPHYLLOIDES, *Planchon, Ann. Sc. Nat.* ser. 4, ii. p. 261; *Grisebach, Fl. Br. W. Ind.* p. 709; *Benth. & Hook. Gen.* i. p. 349:—S. Marchii, *Griseb. l. c.* p. 310.—Diplocalyx chrysophylloides, *A. Rich. in La Sagra Nat. Hist. Cuba*, ii. p. 81, tab. 54; *Walp. Ann.* v. p. 476. In Antillis: Cuba (*La Sagra*), Jamaica (*March*): *non vidi.*

Apparently a shrub or small tree, with terete, spreading, glabrous branches, with axils 3–6 lines apart: leaves alternate, elliptic, very acute from below the middle, subacute at the apex, with about 5 pairs of divergent nerves, $1\frac{1}{2}$–2 in. long, 9–10 lines broad, on channelled petioles 2 lines long; very short axillary racemes, bearing 3 alternate subremote flowers, which are small, subsessile, pubescent; calycle cup-shaped, shortly stipitate, unequally 5-toothed, pubescent, $\frac{1}{2}$ line long and broad; calyx enclosed, of similar shape and size, free upon both its faces, unequally 5-lacinulate, with ciliate margins; corolla small, three times as long as the calyx, shortly agglutinated at its base to the ovary, tubular above, and 4-partite; segments acutely oblong, erect; stamens 4, opposite to the segments; filaments inserted on the margin of the disk, glabrous; anthers ovate, 2-celled, cells laterally attached upon a narrow connective; disk epigynous, enlarged into a tall rounded pulvinate form; style short; stigma capitate, 3-lobed; ovary subglobose, crowned by the disk, sub-4-locular at the base, unilocular at the summit; placenta free, central, truncated at its free apex, from which 4 ovules are suspended over the 4 pseudo-cells. Fruit unknown.

SCHOEPFIOPSIS.

This genus (indicated at p. 68) may be thus defined:—

SCHOEPFIOPSIS, *nob.*—Schoepfia, *in parte, auct.*—Schoepfiaceæ, *Blume*, ordo nov.[1]

Calyculus et *calyx* ut in *Schoepfia* parvi, liberi, cupulati, inæqualiter 3–5-lacinulati. *Corolla* his multo longior, tubulosa; *tubus* sublongiusculus, cylindricus, vel superne subampliatus, imo ad ovarium connatus; *segmenta* 5, lanceolato-oblonga, acuta, apice subreflexa, carnosa, tubo multo breviora, æstivatione valvata, imo macula furfurosa signata,

[1] Mus. Lugd.-Bat. i. p. 175.

maculis in lineis niveis decurrentibus extensis. *Stamina* 5, segmentis opposita; *filamenta* tenuia, e margine disci orta, lineis niveis subcohærentia, apice breviter libera; *antheræ* in fauce liberæ, ovatæ, biloculares, loculis collateraliter adnatis. *Discus* epigynus, conice globosus et alte pulvinatus. *Stylus* tenuis, faucem corollæ attingens; *stigma* capitato-trilobum. *Ovarium* ovatum, ut in *Schoepfia* superne 1-loculare, infra medium semi-3-loculare; *placenta* centralis, liber, apice truncata, e septis adscendentibus trialata; *ovula* 3, ab apice suspensa. *Drupa* baccata, oblongo-ovata, disco coronata, 1-locularis, abortu monosperma. *Semen* suspensum, ovatum; *integumentum* spongiosum, ferrugineum; *albumen* amygdaloideum; *embryo* parvus, apicem versus inclusus; *cotyledones* 2, ovato-oblongæ, plano-convexæ; *radicula* æquilonga, supera.

Arbusculæ *Asiaticæ, ramosæ*; rami *flexuosi*; folia *alterna, lanceolato-oblonga, glabra, subbreviter petiolata*; racemi *axillares, breves, alternatim* 6–7-*flori*; flores *tenuiter pedicellati, plerumque lutei, sæpius odorati.*

1. Schoepfiopsis fragrans, *nob.*—Schoepfia fragrans, *Wall. in Roxb. Fl. Indica,* ii. p. 188; *Tentamen,* p. 18, tab. 9; *D. Don, Fl. Nepal.* p. 145; *G. Don, Dict.* iii. p. 432; *DC. Prodr.* iv. p. 320. In Nepalia et Khasya: *v. s. in herb. meo,* ex herb. Hook. & Th. Khasya, altit. 3000–5000 ped.

A small tree 10–15 feet high, with a thick spongy bark; branches terete, subflexuous, marked by numerous scales; axils $\frac{1}{2}$–$\frac{3}{4}$ in. apart; leaves lanceolate-oblong, acute at the base, acuminate, subinequilateral, chartaceous, smooth, dark green above, and almost nerveless, paler beneath, with inconspicuous fine nerves $2\frac{1}{2}$–$3\frac{1}{4}$ in. long, 7–10 lines broad, on slender channelled petioles $2\frac{1}{2}$–3 lines long; racemes solitary in the axils, subsessile, 1–$1\frac{1}{2}$ in. long; peduncle slender, glabrous, bearing 6 or 7 flowers on slender pedicels 6 lines long; bracteoles small; calycle and calyx $\frac{1}{2}$–$\frac{3}{4}$ line long, unequally laciunulate; corolla tubular, fleshy; tube 5 lines long, 5-grooved at the base, where it is agglutinated around the ovary; segments oblong, acute, shorter by two thirds than the free portion of the tube, each with a fascicle of minute hairs at its base; stamens 5, with filaments subcohering to the tube; anthers ovate, subbilobed, free in the throat; disk epigynous, pulvinate, spongy; style as long as the tube; stigma 3-lobed; ovary turbinate, crowned by the disk, 3 lines long; drupe oblong, nearly white, 6 lines long, 4 lines broad, crowned by the disk; pericarp fleshy, nearly 1 line thick; nut thinly testaceous; rest as in the generic character.

2. SCHOEPFIOPSIS ACUMINATA, *nob.*—Schoepfia acuminata, *Wall. Cat.* 486; *DC. Prodr.* iv. 320; *G. Don, Dict.* iii. 432. In Nepalia, Mont. Pundus: *v. s. in hb. Hook.* Khasya (*Lobb*).

A tree 10–12 feet high; leaves ovate-lanceolate, obtuse at the base, acuminate, palish green above, with immersed fine nerves and slightly revolute margins, paler beneath, with prominent midrib and slightly prominulent nerves ascendingly divaricate, with subimmersed reticulated veins, 3 in. long, 9 lines broad, on slender curving petioles 3 lines long; raceme axillary, 10 lines long, on a slender peduncle, bearing a little above its base about 10 alternate or subopposite flowers on very slender pedicels 1½ line long; calycle and calyx ¼ line long; corolla in bud 3½ lines long, tube 1 line broad; rest as in the generic character.

3. S. CHINENSIS, *nob.*—Schoepfia chinensis, *Gardn. & Champ. Kew Journ. Bot.* i. 308, iii. 328; *Walp. Ann.* i. 181. In Hong Kong: *vix vidi in herb. Hook.*

A straggling branched tree; branches terete, striate, subflexuous, whitish, glabrous, brittle; leaves lanceolate-oblong or oblong-lanceolate, acute at the base, acuminate, penninerved, 2½–3 in. long, 10–15 lines broad, on margined petioles 2–3 lines long; racemes solitary in the axils, 6–9 lines long, 2–4-flowered; flowers sessile, yellow or whitish, odoriferous; calycle and calyx ½ line long; corolla 5 lines long, tube pentagonal, narrowish, 5 lines long; segments 5, acuminate, 2½ lines long; drupe oblong, obtuse at both ends, 5–7 lines long.

A species said to differ from *S. fragrans* in its leaves glossy beneath (not on both sides), in its fruit as large as a cherry (not the size of a field-bean).

4. S. JASMINODORA, *nob.*; Schœpfia jasminodora, *Sieb. & Zuccar. in Abh. math.-phys. Cl. Münch. Akad.* Bd. iv. 8, Abth. iii. p. 135, no. 457; *Blume, Mus. Lugd.-Bat.* i. p. 175; *Walp. Ann.* i. 960. In Japonia: *non vidi.*

Branches terete, subflexuous; leaves ovate, rounded at the base, subobliquely acuminate and recurved, more rarely lanceolate-ovate, 1½–2½ in. long, 10–15 lines broad, on petioles 3 lines long; racemes axillary; peduncle slender, 1 in. long, bearing above 3–5 subsessile flowers; calycle and calyx short, 3–5-dentate; corolla tubular, tube cylindrical; segments 4, subdeltoid, acute.

Cervantesieæ.

This tribe, first proposed by Baillon in 1862[1], included *Cervantesia* and *Iodina*, which he regarded as belonging to the *Olacaceæ*. According to him they differ from *Santalaceæ* principally by their free ovary[2], and are closely allied to *Pyrularia*. He thought that they were also allied to *Cansjera*, though differing in the number and mode of insertion of the ovules. My own observations show that they belong to *Styraceæ*.

Cervantesieæ, tribus *Styracearum*. *Flores* breviter calyculati. *Calyx* majusculus, calyculo insidens, liber, 5-partitus. *Corolla* calyce minor, tubo brevi imo ad ovarium adnato; *segmenta* 5, subexpansa, lobis calycinis alterna. *Stamina* his opposita et segmentis alterna. *Ovarium* et *semen Styracis* structura. Genera *Cervantesia* et *Iodina*.

Cervantesia.

This genus of the 'Flora Peruviana' was established in 1794 by Ruiz and Pavon, with some errors in its diagnosis, which they corrected eight years afterwards on their return to Madrid. In regard to its position in the System, Lamarck first placed it in *Santalaceæ* (1811); Kunth accorded with this (1825), and Endlicher (1840), likewise Lindley (1858). DeCandolle (1856) regarded it as a doubtful genus of that family. I pointed out previously (1851) the very close affinity existing between it and *Iodina*, so close, indeed, that the structure of the flower in the one offered scarcely any discernible difference from that in the other; but as Cavanilles had regarded the calyx in *Cervantesia* as partially agglutinated to the ovary, a circumstance that would place the genus in *Santalaceæ*, I did not then venture to remove it from that family.

Cervantesia, *R. & P.*, char. reformato.

Calyculus parvus, cupulatus, fere ad basin in lacinias 5 acutas fissus; *calyx* hoc multo longior, liber, imo hemisphæricus, 5-angulatus, tubulosus, tubo profunde 5-fido, lobis oblongis, carnosulis, in æstivatione valvatis, in fructu auctus et persistens. *Corolla* colorata, lobis calycinis paullo brevior; *tubus* brevissimus, ad ovarium arcte agglutinatus; *segmenta* 5, petaloidea, late oblonga, truncato-emarginata, erecto-divergentia, circumscisse caduca. *Stamina* 5, e margine disci orta, segmentis æquilonga et alterna, lobis calycinis opposita, glabra; *fila-*

[1] Adansonia, iii. p. 125.
[2] *Tom. cit.* p. 120.

menta subulata, imo compressa; *antheræ* didymæ, ovatæ. *Discus* epigynus, latus, vix conicus, carnosus, intus vacuus, cavitate cum ovarii loculo continua; *stylus* brevissimus; *stigma* subpeltatum, concavum, margine crenulatum. *Ovarium* turbinatum, disco coronatum, late 1-loculare; *placenta* centralis, libera, anguste tæniæformis, e basi adscendens, loculo multo longior, hinc vermiformi-flexuosa, apice ovuligera; *ovula* 2–3 suspensa. *Fructus* ovatus, calyce aucto libero cinctus; *pericarpium* carnosum, 5-fissibile; *nux* conformis, crustacea, 1-locularis, abortione monosperma. *Semen* loculum implens; *integumentum* albidum furfuraceum, subbilamellare; *raphe* inter lamellas, nivea, araneose expansa, e vasis spiralibus confecta; *albumen* carnosum; *embryo* inclusus, subfiliformis, longitudine fere albuminis; *radicula* supera, ad medium pertingens; *cotyledones* 2, carnosæ.

Arbores *Peruvianæ, ramosissimæ*; rami *flexuosi*; folia *alterna, oblonga, sæpe tomentosa, petiolata*; inflorescentia *racemosa*; flores *parvi, calyculati.*

1. Cervantesia tomentosa, *R. & P. Flor. Peruv.* ii. p. 19, tab. 141 *b*.—Elæodendron tomentosum, *Willd. ex R. & Sch. Syst.* v. p. 345.—Casimiroa tomentosa, *Dombey MS.* In Peruvia prov. Tarma prope Acobamba; in prov. Huaocheri et Canta.

A tree 12 feet high, with a hard whitish wood, and a rounded copious head, very much branched; branches thick and somewhat gnarled; branchlets stoutish, short, subflexuous; leaves alternate, oblong, with straightish sides, obtuse at the base, narrowing obtusely toward the apex, subcoriaceous, entire, with revolute margins, smooth and dark green above, deeply sulcate along the midrib, very convex on each side of the latter, without perceptible nerves, woolly beneath, with a rusty-white tomentum, $1\frac{1}{2}$ in. long, 6-$7\frac{1}{2}$ lines broad, on woolly petioles 1 line long, 2–3 lines apart; inflorescence axillary on the younger branchlets; flowers spicately disposed upon a very geniculate peduncle $1\frac{1}{2}$–2 in. long, bearing at each flexure a small fascicle of about 3 flowers on extremely short stout pedicels, all tomentose; calycle acutely 5-partite, expanded; calyx many times its length, and free from it, sub-5-angular at the base, deeply cleft into 5 oblong subacute fleshy divisions, with valvate æstivation; corolla shorter than the divisions of the calyx, adnate at the base around the ovary, free elsewhere; the segments alternate with the calycine lobes; stamens alternate with segments; these and other parts as in *Iodina*; fruit obovate, 9–11 lines long, 5–6 lines broad, environed by

[1] R. & P. Flor. Peruv. iii. p. 20, where this kind of raphe (like that of *Styrax*) is well described.

the much-enlarged thick divisions of the calyx, which are acute and separate at the apex, rounded at the base, and somewhat shorter than the fruit; they are detachable, smooth inside, where they are furnished with an erect scale below the middle, somewhat similar to that I have shown in *C. Kunthiana*; it may be noticed, however, that in fig. 4 in tab. 241 of the 'Flora Peruviana,' these scales are seen only upon the calycine divisions, but in fig. 10 they are shown there as well as upon the fruit, most probably an error. The nature of these scales will be discussed further on.

2. Cervantesia bicolor, *Cav. Icon.* pl. v. p. 49, tab. 475 (1799).—Cervantesia tomentosa, *A. DC.* (*non R. & P.*), *Prodr.* xiv. p. 692. In Peruvia prope Obrajillo et Buenaventura (*Louis Née*): *non vidi.*

A plant collected in 1791 by Née, who accompanied Malaspina in his voyage round the world. He found it at Obrajillo in the valley of Canta, 21 leagues from Lima, and halfway between it and Pasco, and 3 leagues from Haurimayo. It is a species very distinct from the preceding, though confounded with it by all authors: it differs in its more lax and more slender habit, in its more membranaceous leaves covered beneath with rusty white (not deep red) tomentum, in its longer petioles, and in its very different inflorescence, and in its fruit. It is a tree more than 12 feet high, with numerous slender, alternate, tomentose branchlets; leaves alternate, spreading, ovate-oblong, with arching sides, subobtuse at the base, obtusely narrower towards the summit, submembranaceous, with entire subrevolute margins, covered with a whitish ferruginous tomentum, but when old denuded of hairs above, $2\frac{1}{2}$ in. long, 11 lines broad, on stoutish tomentose petioles 3 lines long, the midrib and many slender nerves being scarcely visible under the hairs; racemes axillary, abbreviated, on a short peduncle squamously bracteate at its base, branching above, bearing about 8 distant small flowers on very short stout pedicels, all deeply tomentose; calycle very small, acutely 5-fid nearly to its base; calyx inserted within the former, many times its length, 5-angular, deeply 5-cleft, the lobes obtusely oblong, fleshy, with valvate æstivation; corolla with a very short tube, adnate at its base to the ovary, with 5 fleshy white segments shorter than the calycine divisions; stamens, disk, ovary, and style as in the preceding species; fruit globose, oval, 4 lines long, $3\frac{1}{2}$ lines broad, invested by the 5 much-enlarged, very thick divisions of the calyx, whose

valvate margins, closely appressed but not agglutinated together, form a subglobose glabrous whole, 7 lines long, 6 lines broad, the divisions being 1 line in thickness; nut covered by a dark thinnish pericarp, unilocular and monospermous; seed filling the cavity of the nut, perforated at its base, covered by a whitish simple integument; this and other parts as in the generic character.

Cavanilles makes no mention of the peculiar scales which I saw upon the inner surface of the calycine division of *C. Kunthiana*, though he mentions the membranous corolla as intervening between the fruit and those divisions.

I need not enter into the history of this species, nor how it came to be confounded with *C. tomentosa*. Cavanilles, half inclined towards the opinion of their identity, concluded at last by saying, "hoc affirmare non audeo, propter characterum discrepantiam."

In the typical species the branches are much stouter, more suddenly and approximately bent, the branchlets more straggling and flexuous, the leaves more oblong, deeply channelled down the middle, the sides very convex, straighter and more recurved, covered beneath with a rusty whitish tomentum, the petioles being shorter and narrower. In Née's plant, the branches and branchlets are straighter and more slender, the leaves are more elliptic, flatter, less rigid, and covered beneath with dense red tomentum, the petioles broader and longer. In the former plant the inflorescence consists of very small remote fascicles of few subsessile flowers, seated upon the geniculations of a longish very flexuous peduncle; in the latter species it forms an axillary panicle, alternately branched, each branch bare at its base, and bearing upwards many subaggregate flowers upon distinct stoutish pedicels.

There is also a difference in the development of the fruit, as the drawings of the two authors manifest: in the former species the fleshy, much enlarged calyx that invests the nut has its 5 divisions divaricate above and below; in the latter these are less elongated, and closely invest the nut all round.

We thus find the two species marked by sufficiently valid differences.

3. Cervantesia Kunthiana, *Baillon, Adans.* ii. p. 373, tab. xi., iii. p. 125.—Cervantesia tomentosa, *H. B. K.* vii. p. 139 (*non R. & P., nec* C. bicolor, *Cav.*). In prov. Quitensi, inter Caxamarca et Truxillo, alt. 6600 ped.: *v. s. in herb. Hook.* Valle Chillon, in prov. Quitensi, alt. 8040 ped. (*Capt. Hall*).

The above specimen quite corresponds with Bonpland's plant, in regard to the very peculiar form of its inflorescence. It is a tree, according to that botanist, 12–18 feet high, which in Chillon bears the name of "el Olivo." It is branching, its branchlets villously tomentose; leaves lanceolately oblong, acute at both ends, entire or obsoletely denticulate on the margins, coriaceous, slightly hairy above, densely fusco-tomentose beneath, 2 inches or above long, 8 lines broad, on pubescent petioles 2½–3 lines long; inflorescence axillary and terminal, dichotomous, each branch consisting of a straight peduncle 1½ in. long, bearing about 14 sessile flowers subglobose in bud, 2 lines long, spicately disposed at sensible distances, all ferruginous-tomentose; calycle minute, 5-toothed; calyx ovate, cleft to the base into 5 elliptic-acute divisions, very fleshy, densely tomentose outside, glabrous within; much shorter petals, green according to Kunth, as in *Iodina*; corolla, stamens, disk, and ovary as in the generic character. Fruit oblong-oval, 3½ lines long, 2½ lines broad, environed by the now augmented glabrous, rugous, rigidly fleshy, dark red divisions of the calyx, which give out a crimson dye in boiling water; drupe blackish, rugous, striate, enclosing a crustaceous nut, which is 1-celled and monospermous; seed as in the generic character.

Before I had examined the structure of the fruit in this species, I was unable to harmonize the marked differences shown in figs. 4, 8, 9, and 10 in plate 241 of the 'Flora Peruviana,' and figs. *e*, *f*, *g* in Cavanilles's plate 475, and in their several descriptions; but now I see how these may be reconciled. If we turn to the analytical figures of my drawing, Plate III., we may trace the same principle of structure, indicated in the plates above quoted, as that shown in *C. Kunthiana*. In the latter the fruit is surrounded by an envelope consisting of the much enlarged divisions of the calyx, which are 8 lines long, 2 lines broad, somewhat narrower at each extremity; these, disjoined in fact, but touching one another in the middle, gradually divaricate at each extremity; and after maceration they may be completely separated. The divisions, now distinct, are 6½ lines long, 2 lines broad, rugously tubercled and convex outside, very thick and rigid, quite smooth and concave within, furnished there, at the distance of 4 lines from the base, with a membranaceous brown scale 1 line long, fixed there by a transverse basal line, but quite free above, bearing at its subtruncate apex two small ovate bodies, appearing like a stamen with a dilated filament. The question arises, What is the

nature of this, whence and how it came there; for in the flower the smaller corresponding divisions of the calyx are quite smooth within, without any indication of a scale. Can it be a stamen detached from its normal position in the flower, and transferred with a portion of the margin of the disk to the site shown in the segments which surround the fruit? All I can say on this point is that the fact is unquestionably manifest.

A scale in a similar position, upon each enlarged division of the calyx, in the fruit of *C. tomentosa*, is also shown in fig. 4, tab. 241 of the 'Flora Peruviana.'

Iodina.

This genus was proposed in 1833 by Hooker and Arnott, for a plant previously known and referred to *Ilex* and *Celastrus*. Endlicher, who acknowledged *Iodina* in 1840, considered it a doubtful genus of the *Ilicineæ*. Reisseck[1], in 1861, excluded it from that family, assigning it a position in *Santalaceæ* near *Thesium*; at the same time indicating its floral characters in greater detail, accompanied by a good drawing. In 1851, I thought the genus belonged to *Olacaceæ*[2]; and in 1853 it was classed by me accordingly[3]. In 1862, Baillon adopted this view[4], associating *Iodina* with *Cervantesia* in a distinct group (*Cervantesieæ*). Prof. De Candolle in forgetfulness has taken no notice of the genus. Messrs. Bentham and Hooker, in 1862, referred *Iodina* to the *Santalaceæ*[5]; but it cannot belong there, on account of its distinct calyx and corolla. That it is intimately related to *Cervantesia* there can be no doubt; and it now appears to me clear that neither of them belong to *Olacaceæ*, but must be classed in *Styraceæ*.

Iodina, *Hook. et Arn.*—Celastrus, *ex parte, auct.* (*Char. emendatus.*)

Calyculus[6] brevissime stipitatus, imo hemisphærice cupulatus, latere externo in lobum erectum acutum prolongatus, calyce dimidio brevior, subhirsutus. *Calyx*[7] ovatus, fere ad basin 5-partitus; *lacinia* acute oblonga, vix expansa, concava, apice subinflexa, carnosula, extus pilosula, intus scabridula, ad medium fasciculo pilorum donata, æstivatione valvata. *Corolla* calyce subbrevior, imo tubulosa; *tubus* brevissimus, ad ovarium arcte adnatus; *segmenta*[8] 5, cuneato-deltoidea, truncata,

[1] Flor. Bras. fasc. xxviii. p. 77, tab. 23.
[2] Contrib. to Bot. i. p. 29.
[3] In Lindley's Veg. Kingd. p. 444 *a*.
[4] Adansonia, iii. p. 125.
[5] Gen. Plant. i. p. 345.
[6] "*Bractea*" (Bentham & Hook.).
[7] "*Calyx* aut *perigonium*" (Reisseck).
[8] "*Disci lobi*" (Reisseck).

bisinuata, angulis obtusis subinflexis, glabra, smaragdina, laciniis calycinis alterna. *Stamina* 5, margini disci inserta, segmentis alterna et æquilonga; *filamenta* subulata, imo compressa, apice subito inflexa; *antheræ* didymæ, loculis ovatis, sine connectivo paulum sub apice affixis, post dehiscentiam applanatis. *Discus* epigynus, subconvexus, carnosus, intus vacuus, cavitate cum ovarii loculo continua; *stylus* subbrevis, subulatus; *stigma* cupulatum, margine subdentatum. *Ovarium*[1] turbinatum, parvum, viride, 1-loculare; *ovula* 3, minuta, ab apice *placentæ* centralis liberæ crassiusculæ suspensa. *Drupa* ovata, structura ignota.

Arbusculæ *demissæ, in regione Argentina vigentes, iterum iterumque ramosæ, glaberrimæ*; folia *alterna, brevissime petiolata, rhombiformia, angulis spiniferis, rigidissima.* Flores *plurimi, parvi, supra* pedunculum *brevem axillarem bifidum velutinum* crebre congesti.

1. Iodina cuneifolia, *nob.*—Ilex cuneifolia, *Plum. in Icon. ined.* v. tab. 152; *Plum. Pl. Amer. edit. Burm.* ii. p. 109, tab. 118. fig. 2 (1757); *Linn. Sp. Pl.* 181 (1762); *Lam.* (*in parte*) *Dict.* iii. p. 148 (1789); *Willd. Sp. Pl.* i. p. 712 (1797); *DC. Prodr.* ii. p. 16 (1825). In regione Argentina, Rio Uruguay (*Tweedie et Baird*), lect. in 1830, sec. Hook. & Arn.: *non vidi.*

A species first made known to us by Burmann in 1757, in his edition of Plumier's 'Plant. Amer.,' the locality not being stated; this has since been found to be Monte Video. An earlier date than the above must be assigned to this plant, as Burmann copied his drawing from Plumier's inedited volumes. Who gathered the plant thus figured is not known; but it must have been some collector prior to the time of Commerson, who visited Monte Video in 1767. The only collector known to us prior to that date is Dampier, who landed on that coast between 1680 and 1700, and who made botanical collections at every place visited by him. Linnæus enumerated the plant in 1762, referring to Burmann as his authority. It is next described by Lamarck in 1789, who coupled with it his variety β (*bonariensis*), which is the following species.

Iodina cuneifolia is a small tree, very much branched, its branches quadrangular, with axils 4–6 lines apart; leaves alternate, rigid, rhomboidally oblong, very cuneiform from near the summit to the base, the angles acute (not spinescent), horizontally many-nerved, $2\frac{1}{4}$ in. long, $1\frac{3}{4}$ in. broad (the terminal leaf $3\frac{1}{4}$ in. long, 2 in. broad at the angles), on petioles $\frac{1}{2}$ line long. According to Lamarck, who saw Commerson's specimen, the flower is axillary,

[1] "*Ovarium* biloculare, *loculis* 1-ovulatis" (Hook. & Arn.); "1-loculare; *ovula* 3, ex apice placentæ liberæ suspensa" (Baillon, Reisseck).

solitary, very small, and sessile. Though little is known of it, this species is essentially distinct from the following one.

2. Iodina rhombifolia, *Hook. & Arn. Bot. Misc.* iii. p. 171 (1833); *Reisseck in Fl. Brasil.* fasc. xxviii. p. 78, tab. 23 (1861). —Celastrus rhombifolia, *Hook. & Arn. l. c.* p. 171.—Celastrus Iodina, *Steudel, Nom.* p. 314.—Ilex cuneifolia, var. β (bonariensis), *Lam. Dict.* iii. p. 148 (1789); *DC. Prodr.* ii. p. 16. In regione Argentina: *v. v., et sicc. in herb. meo,* n. 629, Rio Quinto, San Luiz et La Represa (prov. S. Luiz).

A low-growing tree, again and again branched alternately, ultimate branches 4–6 in. long, terete, slightly flexuous, stoutish, yellowish, striolate, with axils $\frac{1}{4}$–$\frac{3}{4}$ in. apart; leaves rhomboidally oblong, the terminal angle much longer than the two lateral ones, cuneate at the base, the three angles sharply spinescent, rigidly coriaceous, very glabrous, generally plicate, above of a yellowish colour, nearly concolorous beneath, inferior nerves ascending, the upper nerves more patent, all arcuately conjoined within the margins, with semi-immersed transversely reticulate veins, all with the midrib prominulent and stoutish, $1\frac{1}{2}$–2 in. long, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad, including the lateral spines, on a plano-convex petiole 1–$1\frac{1}{2}$ line long; inflorescence axillary, consisting of a bifid peduncle 3 lines long, cinereo-velutinous, each branch bearing about 10 small congested flowers about 1 line broad, with a construction detailed in the generic character.

I collected this plant in May 1825, making a drawing and an analysis of its flowers in their living state during my stay there: the plant is mentioned in my 'Travels,' i. p. 106.

DESCRIPTION OF THE PLATES.

Plate I.

Fig. 1. A portion of a plant of *Schoepfia arborescens*;
2. The axillary peduncle bearing 7 flowers;
3. The calycle on its pedicel;
4. The irregularly 5-toothed calyx;
5. The corolla in bud: *all nat. size.*
6. The calycle on its pedicel;
7. The calyx: *both magnified.*
8. The corolla in bud, *magnified.*
9. The corolla with its limb expanded, its lower portion adnate to the ovary;
10. The upper portion of the corolla cut open to show the segments and stamens seated on the margin of the elevated pulvinated disk which surmounts the ovary;

Fig. 11. The corolla cut open and the anthers removed, to show the 5 furfuraceous patches at the base of the five segments: *all magnified.*

12. A stamen seen before and behind, *more magnified.*

13. The pulvinate disk seated upon the ovary;

14. A longitudinal section of the same, showing it to be 1-celled at the apex 3-celled below the middle, the ascending margins of the semisepta confluent above, forming the wings of the free central placenta, from the truncated apex of which 3 ovules are suspended;

15. A transverse section of the same, showing the same parts: *all equally magnified.*

16. A drupe;

17. The seed removed: *both natural size.*

PLATE II.

Fig. 1. A portion of a plant of *Schoepfiopsis acuminata*;

2. The calycle on its pedicel;

3. The enclosed calyx;

4. The corolla: *all natural size.*

5. The calycle;

6. The calyx;

7. The corolla, its lower short portion adnate around the ovary, its limb expanded;

8. The corolla cut open to show the stamens seated on the margin of the disk: *all magnified.*

9. The anther, back and front view: *both much magnified.*

10. The ovary and pulvinate disk;

11. A longitudinal section of the ovary, showing it to be 1-locular at the summit, the semisepta forming the wings of the central placenta, from the truncated apex of which the ovules are suspended;

12. A transverse section of the same: *magnified on the same scale.*

13. A drupe;

14. The same, cut open to show the single seed suspended;

15. The seed extracted: *all natural size.*

PLATE III.

Fig. 1. A portion of a plant of *Cervantesia Kunthiana*, with the two branches of its axillary inflorescence;

2. The axillary dichotomous inflorescence;

3. The small 5-toothed calycle on its pedicel: *all natural size.*

4. The much larger 5-cleft calyx seated on the calycle, *magnified.*

5. The corolla removed, showing the 5 petals and alternate stamens;

6. The same parts, seen from above, showing the relative positions of the divisions of the calyx, segments of the corolla, the stamens, and style: *both equally magnified.*

7. A stamen, seen from before and behind, *more magnified.*

8. The adnate ovary, conical disk, style, and stigma;

9. A longitudinal section of the ovary and disk, showing the former to be 1-celled, with a verminform free ovuliferous placenta rising from the base;

Fig. 10. A section of the unilocular ovary, showing its vermiform placenta: *magnified.*

11. The free placenta removed, from whose apex 3 ovules are suspended, *magnified.*
12. The fruit environed by the 5 much-enlarged divisions of the calyx;
13. The same divisions seen from within, each with its peculiar scale: *both nat. size.*
14. One of the scales, *magnified 4 diameters.*
15. A transverse section of the same, showing it to be very thick, rugous, and convex outside, smooth and concave within, *equally magnified.*
16. Fruit freed from the calyx, *natural size.*
17. The same with half of the pericarp removed, to show the suspended seed;
18. The suspended seed, removed: *both nat. size.*

PLATE IV.

Fig. 1. A portion of a plant of *Iodina rhombifolia.*

2. A many-flowered axillary inflorescence;
3. A flower in bud: *both natural size.*
4. The calycle;
5. The calyx half-cleft into 5 divisions;
6. A longitudinal view, with half of the calyx removed, showing the petals and the alternate stamens;
7. The flower expanded, seen from above, showing the relative positions of the several parts;
8. A longitudinal section of the same, showing the 1-celled ovary and free central erect placenta bearing 3 ovules suspended from its apex: *all equally magnified.*
9. A stamen, shown before and behind, *more magnified.*
10. Two of the 5 stamens, shown to be alternate with the petals;
11. Longitudinal section of the 1-celled ovary, with the free central placenta;
12. The placenta removed, showing 3 ovules suspended from its summit *all magnified.*

Notes on the Mahwa Tree (*Bassia latifolia*). By E. Lockwood, Esq. Communicated by Thos. Christy, F.L.S.

[Read February 21, 1878.]

Useful as are many of the plants found in the plains and forests of Monghyr, undoubtedly there are none so useful as that which demands our present attention—the Mahwa tree a member of the Sapodilla family, the *Bassia latifolia* of botanists. This tree may be called a fountain yielding food, wine, and oil to the inhabitants of the country where it grows.

Brandis, in his 'Indian Forest Flora,' says of this tree:—"It attains 40–50 feet in height, with a short trunk 6–7 feet in girth,

and numerous spreading branches, forming a close, shady rounded crown. It is propagated by self-sown seedlings and is protected in most parts of India. It is abundant in all parts of Central India, from Guzerat to Behar. There seems no doubt that the tree is indigenous in the forests of the Satpura range of Western India." It thrives," he says, "in dry stony ground."

Any one standing on the dry metamorphic Kharakpoor hills in the district of Monghyr, 250 miles north-west of Calcutta, and looking into the plains below, may see a hundred thousand Mahwa trees, which, if fresh from Calcutta, he will probably mistake for mango trees. But, unlike that of mango trees, which are uncertain in their yield, the Mahwa crop never fails; for the part eaten is the succulent corolla, which falls in great profusion from the trees in March and April. This season is a grest feasting time for the humbler members of creation. Birds, squirrels, and tree-shrews (*Tupaia Elliotti*) feast among the branches by day, whilst the poor villagers collect the corollas which fall on the ground on all sides. Nor does the feasting end with the day. At sunset peacocks and jungle-fowl steal out from the surrounding jungle to share the Mahwa with deer and bears, many of which fall victims to the bullets or arrows of the hunters, who sit concealed in the branches overhead. South of the Ganges, in Monghyr, the Mahwa is by far the most abundant tree. It grows on poor stony soil, ill-suited to most other trees or for the plough; and, fully appreciating its valuable properties, the natives protect it wherever it grows.

During the four years which I passed in Monghyr as magistrate, I visited every part of the 4000 square miles under my charge in the cold season, paying constant attention to the natural history, particularly to the botany, of the district. The Mahwa tree, which I had not seen previously in Lower Bengal, attracted my especial attention; and I calculated that there must be not far short of a million trees in Monghyr alone. Each tree yields two or three hundredweight of corollas; so that the total yield of Mahwa flowers cannot be far short of a hundred thousand tons in Monghyr alone. Of this amount a vast quantity goes to feed the forest birds and beasts; but of that portion which is collected by the natives by far the greater part is eaten, and supplies nourishing food to the poorer classes. The Santhals, who use it largely, are a plump and happy race, the only people I have ever seen in India who enjoy a hearty laugh; and this I attribute partly to the

nourishing qualities of the Mahwa, supplemented with venison and other wholesome game which the woods supply.

During the season of scarcity which prevailed at Behar during 1873–74, the Mahwa crop, which was unusually abundant, kept thousands of poor people from starving; and all famine-officers will recall its peculiar odour as they passed through the villages where it had been collected. The residue of the Mahwa which is not eaten is taken to the distilleries, and there, with the aid of rude pot-stills, is converted into a strong-smelling spirit, which bears considerable resemblance to whisky. The Government holds a monopoly of spirit-manufacture; and when I first went to Monghyr in 1873 the custom was to charge a duty of eight shillings for every cwt. of the raw material as it entered the distillery, on the supposition that so much Mahwa would only yield three gallons of proof spirit. Subsequently, in consequence of experiments made by the officers under me, this duty was somewhat raised; but in England I find that over six gallons of proof spirit can be produced from a hundredweight of Mahwa. The Government of India should be made aware of this fact; and it would probably be advantageous to introduce patent stills in the place of the rude machines now in use.

The amount of Mahwa which nominally paid Government duty yearly in Monghyr, was 1750 tons; but with patent stills under Government control, the Mahwa would probably yield a much larger revenue to the State. An Italian gentleman who was living at Monghyr when I was there, took out a patent for removing by a very simple process the essential oil, or whatever it is, which gives the Mahwa spirit its peculiar smell; and for some time I thought he would make a rapid fortune: orders poured in on him from Calcutta, and the demand promised to be immense. But just as the inventor had taken up a whole side of the Government distillery, and got all his preparations complete, the rum-distillers in Calcutta petitioned the Board of Revenue, and a prohibitive duty was imposed, which completely put an end to the manufacture of scentless Mahwa spirit. A sample was sent to the Chemical Examiner at Calcutta; and he reported that the spirit was pure and wholesome, and came very near good foreign brandy.

But not only are the Mahwa flowers good for distilling spirit, they are still more useful for feeding cattle. My father, the rector of Kingham, has been feeding his pigs on the Mahwa which I brought home, and Mahwa pork is beginning to be cele-

brated in his neighbourhood. Indeed, so favourably has it been received, that I have been requested to procure considerable quantities, both for distilling spirit and for feeding cattle. The *Bassia* family is the only family I know which yields a flower in sufficient quantities for feeding cattle and distilling spirit on a large scale. potatoes, maize, and barley, which are principally used, are costly in production and uncertain in their yield; but the Mahwa crop never fails. The oldest inhabitant in Monghyr had never heard of a season when the Mahwa crop was not abundant; for whether the fruit subsequently forms or not, the corolla is certain to be there, and certain to fall in great profusion. The extraordinary keeping-qualities of Mahwa form also a further recommendation to its introduction into England. Before leaving India, I had a ton shovelled into sacks and put on board a vessel in Calcutta. They were gathered in April 1876, and, after being kept for nearly two years, are as good as when first dried. No weevil, apparently, attacks these flowers as they attack grain.

India would benefit greatly if Mahwa flowers met with a demand in England. The vast forests of Mahwa trees, which now yield little profit to their owners, would soon become a source of wealth; and the collection of the corollas would give work to thousands of poor people who at present inhabit the rocky country where the Mahwa grows.

To sum up the merits of the Mahwa-flowers for distilling-purposes and feeding cattle, they are:—1, cheapness; 2, unlimited supply; 3, certain yield; 4, nourishing qualities; 5, good keeping-qualities.

The fruit which follows after the corollas have fallen, yields seeds from which a greenish-yellow oil is produced. This is used to adulterate *ghi* or clarified butter. This substance has some commercial importance, inasmuch as it is worth £35 a ton for soap-making, according to Mr. Cooke's report on oils and oil-seeds of India.

On the Laws governing the Production of Seed in *Wistaria sinensis*. By THOMAS MEEHAN, Germantown, Philadelphia. Communicated by the Rev. G. HENSLOW, F.L.S. &c.

[Read March 7, 1878.]

THE Academy of Natural Sciences of Philadelphia did me the honour of publishing, in the 18th volume of its 'Proceedings'

(1866, p. 401), a paper from my pen on the Consumption of Force in overcoming Gravitation by Plants. I gave an account of experiments and observations, showing that the effort of a plant to elevate itself above the surface of the earth was a heavy draft on nutrition, and just so much diverted from vegetative growth.

One of my illustrations was furnished by the common Chinese *Wistaria.* When a branch is allowed to run along the ground, over a tree or fence, or nailed against a wall, or is in any way supported instead of having to support itself, it grows with wonderful rapidity. I have known branches under these circumstances grow 30 feet in one season; and I believe much greater growths than this are on record. In America nurserymen make tree Wistarias by training a branch up a stake to any given height, which after two or three years is able to sustain the head when the stake is taken away. No matter how rich may be the soil, or how favourable may be the circumstances under which the plant is growing, the most vigorous annual growths on these heads seldom exceed 3 or 4 feet. I know of perhaps one hundred of these tree Wistarias from ten to twenty years old in my own vicinity; and I have never seen one that ever made a shoot which in one season touched the ground, though the stems may not have been more than from 4 to 6 feet high. Similar facts are set forth in detail in the paper I have referred to.

In 1868 I made another observation on these "tree Wistarias," which was also published in the same 'Proceedings' (see vol. xx. p. 314, 1868), that these "tree" forms produced seeds abundantly, while those which were supported by extraneous means rarely yielded any.

It is a matter of common note that the *Wistaria,* as *usually* seen both in America and Europe, rarely seeds. Of course vegetable physiologists had already known that a distinction had to be made between vegetative force and reproductive force. They are not antagonistic; but one grows out of or supplements the other. A young tree does not commence seed-bearing till the exuberance of its early life is checked. To some extent the two forces do seem antagonistic. The youngest and most vigorous tree can be made to flower if a ring of bark be taken from it; and a graft from a vigorous young tree produces fruit very soon when worked on a tree of bearing age, though its parent tree may not assume the reproductive condition for years to come. Still the antagonism is not distinctive; for there is a manifest coexistence between the two forces.

Physiological writers may not have called attention to these different forms of vital force as pointedly as I have done here; but there is no novelty in the facts. The matter I wished to draw attention to in the last paper I have noted above, was that the production of fruit in the *Wistaria* was an additional proof that the vegetative force was considerably drawn on by the self-sustaining position of the *Wistaria,* as evidenced by the activity of the reproductive forces.

Recent contributions to vegetative biology, especially in relation to the value of cross-fertilization by insect agency, lead me to believe that some further facts in the life-history of *Wistaria* may be acceptable to botanists.

As before noted, the *Wistaria,* as ordinarily seen, produces no seeds. It flowers abundantly. One would suppose that the facts I had already published would show that the failure to seed was a matter of nutrition, as regulated by the relative condition of the two before-named forces; but attention has been drawn to it in connexion with the visits of insects, and the failure to produce seed is supposed to arise from the fact of bees not cross-fertilizing the flowers. Bees visit the flowers in great numbers, but they always bore the corolla from the outside instead of entering the mouth; and the inference is drawn that the flowers do not perfect their seed, viz. being presumedly dependent on their own pollen.

I may here remark that the raceme is made up of nearly a hundred flowers, borne on pedicels which become gradually weaker from the base to the summit. Governed by what we have called to mind of vegetative power, the *last* one to open on the raceme we may call *the weakest.* I now find that when seed is formed there is seldom more than one legume on the branch; and that one is from the *last* flower on the raceme in nearly all cases. In a few cases the fruitful flower is not absolutely the last; and in perhaps 2 or 3 per cent. of the cases there may be two legumes on one raceme; but the *second one* is *far on towards the end.*

Keeping in view what has been said of the distinct forms of vital force, I would say that only when the reproductive has gained some advantage over the vegetative force is seed assured.

I submit these facts as proving that the failure of the *Wistaria* to produce seeds under cultivation has no reference to questions of pollinization by either direct insect or other aid, but that it is a question of harmonious relationship between the two nutritive powers.

A Synopsis of Hypoxidaceæ.

By J. G. Baker, Esq., F.R.S., F.L.S.

[Read February 21, 1878.]

Another group of petaloid Monocotyledons (in addition to Liliaceæ and Iridaceæ) of which a synopsis is greatly needed for daily use is Hypoxidaceæ. The latest that is practically usable is that of Roemer and Schultes, published in the second part of the 7th volume of their 'Systema Vegetabilium,' in 1830. This, for the date, is a full summary of what was known and had been written about these plants; but of a large proportion of the species the authors had had no opportunity of examining specimens, and could therefore only cite the descriptions of other writers, without being able to reduce them to one common formula. An author writing under such circumstances is both sure to admit too many species and to fail to appreciate their true relationship. This first point is illustrated by the fact that from the species of Hypoxidaceæ admitted in this work we must deduct as synonyms or trifling varieties at least 25 per cent. The Order belongs essentially to the warm temperate zone; so that the number of new species which have been discovered since 1830 is not so large in proportion as it would most likely have been in a set of plants more tropical in their geographical distribution. But a considerable number of additions have been made, principally in Natal and Tropical Africa. The number of species which I have admitted is 64; and by counting as species less clearly marked forms which many would rank as such, but which I have placed as varieties, the number might be raised to 80. As I have taken considerable pains during several years to collect information about them, and have been able to examine specimens of all but two species, which I know from figures only, I propose now to attempt to supply the much-required synopsis.

Hypoxidaceæ, we may say, form a group of plants containing 4 genera and between 60 and 70 species—differing from Amaryllidaceæ (using the term in a restricted sense) by their tuberous root-stocks, persistent leaves of grass-like or coriaceous, never fleshy, texture, by their more persistent or firmer perianth-segments, of which the three outer are generally green and hairy on the outside, by the general tendency of their leaves, scapes, and other parts to become clothed with hairs, and by the thick crustaceous testa of their seeds, which show a couple of more or less

distinct prominences, one at the funiculus and the other at the foramen. On the other side their alliance is closest with the Vellosieæ, which differ by their shrubby habit, the entire absence of a tuberous root-stock, by their abundant glandulosity, flowers never yellow and hairy, and by their seeds with a coriaceous testa and embryo placed in a different position in the albumen. If, following the plan proposed by Mr. Bentham ('Flora Australiensis,' vi. 416, and Journ. Linn. Soc. xv. 491), we treat Amaryllidaceæ as one large comprehensive Order, including Hypoxidaceæ, Hæmadoraceæ, and Vellozieæ, in addition to Amaryllidaceæ as usually understood, this will give us an Order of not less than 800 species, marked in the series with an inferior ovary, as Liliaceæ is marked in the series with a superior ovary, by its regular or nearly regular petaloid perianth, 6 stamens, trilocular ovary with axile placentation, and seeds furnished with copious albumen. Liliaceæ, then, with 1800 species, will include substantially all the great body of the petaloid Monocotyledons with regular or slightly irregular flowers, albuminous seeds, and a superior ovary; Amaryllidaceæ and Iridaceæ, with 1500 species, all those with an inferior ovary. Under Amaryllidaceæ, as thus constituted, we shall have to define at least eight tribes. The old Amaryllidaceæ will claim three, well defined and clearly limited, the acaulescent bulbs which form the central mass of the old Order; and, in addition to these, Alstrœmerieæ and Agaveæ. Hypoxideæ will be a fourth well-marked tribe, and Vellosieæ a fifth. Under Hæmadoraceæ we shall require to admit at least three tribes, unless, as perhaps will be found best, we take out altogether from the Order *Wachendorfia*, *Barbaretta*, and *Xiphidium*, and relegate them to Liliaceæ. By their leaves, often equitant and laterally compressed, and stamens, often reduced to three, Hæmadoraceæ give us links of transition between Amaryllidaceæ and Iridaceæ. However, I do not propose upon the present occasion to enter into detail upon the question of the general classification of this Order, but simply to lay stress upon what concerns Hypoxidaceæ,—that all its members have a close affinity with one another, that it forms undoubtedly not more than a single well-marked tribe out of seven or eight of an Order thus constituted, and that, except in the case of the monotypic Cape genus *Pauridia*, in which the stamens are reduced to three, it shows no appreciable variation from the typical character of the Order as just indicated—the perianth being always quite regular, with six segments,

each with its corresponding stamen, and the ovary trilocular and strictly inferior. Taking the organs one by one, the following are their pricipal characters and variations.

Root-stock.—We have two principal types of root-stock in the tribe: the commonest, a firm perennial tuber with a thin rind, which is sometimes as large as a turnip, is crowned outside the tuft of leaves and scapes of the year with the withered relics of the year before in the shape of fibres or brown membranes. This type is shown through *Molineria*, *Euhypoxis*, and *Eucurculigo*. The other type is an annual corm, like that of a *Crocus*, with several tunics of interlacing or honeycombed fibres. This type is shown in *Pauridia*, in the subgenus *Ianthe* of *Hypoxis*, and the subgenus *Forbesia* of *Curculigo*; so that the difference between two kinds of root-stock separates both the two principal genera of the Order into two unequal halves. The new annual corms originate from the top of the old ones, and are consequently flattened at the base. The root-fibres are usually cylindrical and fleshy in texture.

Leaves.—The leaves are always developed simultaneously with the flowers, and are grass-like or coriaceous in texture, never fleshy and evanescent as in the typical bulbous Amaryllideæ. In the perennial species of *Hypoxis* they often show a distinct trifarious arrangement. They are never equitant and flattened laterally, as is so common in Iridaceæ and Hæmadoraceæ. In *Hypoxis* and *Pauridia* they are sessile, dilated at the base, not plicate in the blade, and in shape rarely subterete, usually either linear or lanceolate. In *Forbesia* they are narrow and sessile, but distinctly plicate. In *Molineria* and *Curculigo* proper they are always petioled and very distinctly plicate, linear, or lanceolate, narrowed very gradually from the middle to both ends. In *Curculigo seychellensis* we have a very large bifid, plicate, palm-like leaf, with a long petiole, armed with stout pungent prickles.

Pubescence.—In *Pauridia* and the annual species of *Hypoxis* we have all parts of the plant quite glabrous. In *Molineria*, *Curculigo*, and the perennial species of *Hypoxis*, hairs are present in greater or smaller quantity. They are most constant and plentiful on the scapes and ovaries, and usually extend more or less to the leaf, especially its underside, and to the outside of the three outer segments of the perianth. The pubescence varies greatly, not only in quantity, but in character, but is never glandular, as is so conspicuously the case in the neighbouring tribe

Vellozieæ. A mat of tomentum and a stellate arrangement of the hairs occur occasionally, but rarely, in Hypoxidaceæ. Generally the hairs are simple; and upon the scapes and ovaries they are usually bristly in texture and persistent in duration.

Inflorescence.—All the Hypoxidaceæ are acaulescent. There is no such thing in the tribe as a leafy flower-stem. The scapes produced from a single root-stock are few, but indefinite in number. Throughout *Hypoxis* and in *Pauridia* we have always a produced scape, bearing sometimes a single flower, sometimes few flowers in a corymb, sometimes more numerous flowers in a centripetal raceme, with linear or setaceous bracts. In several species of *Molineria* and *Curculigo* we have numerous flowers packed together in dense heads, each flower subtended by a persistent lanceolate, scariose bract. In some of the other Curculigos the flowers spring singly from the root-stock in the axil of large, scariose, lanceolate bracts upon peduncles so short that when the flower fades the fruit is quite hidden in the radical tuft. Altogether inflorescence in the tribe furnishes one of the best characters for the discrimination of groups and species.

Pistil.—The ovary, so far as I have been able to observe, is always three-celled. In fruit the septa often disappear; and this has led to some of the Hypoxidaceæ being described as unilocular. Except in *Pauridia*, where it is deeply 6-cleft, the style is always simple. There is a great variety in the shape and consolidation of the three stigmas.

Perianth.—As indicated already, the perianth is always perfectly regular, with divisions spreading horizontally when the sun shines, the three outer usually firmer in texture and narrower and more acute than the three inner. Only once, in the case of an Australian species, have I seen the perianth deviate from typical hexamerous symmetry; and here it become tetramerous. As will be seen, the presence or absence of a tube above the ovary furnishes the best characters to mark the genera.

Stamens.—The six stamens in position are correlated with the shape of the perianth, being epigynous in insertion where there is no tube, and inserted in a single series at the throat of the tube where a tube is present. The filaments are always short and erect. The anthers always dehisce down the face by a slit near the edge; they vary considerably in shape, being sometimes absolutely basifixed, and sometimes slightly versatile; they sometimes cohere obscurely in a ring round the style in an early stage,

and have been described as monadelphous; but this does not continue when the flower is fully expanded.

Fruit.—In *Pauridia*, *Molineria*, and *Curculigo* the fruit is always indehiscent. In *Hypoxis* it is a capsule which slits off by circumscissile dehiscence below the operculum, and then sometimes, but not always, breaks up into three loculicidal valves. The peculiar character of the seed, its thick crustaceous coat of two layers, its two prominences, its soft albumen, and the small straight central embryo hold good throughout the whole tribe, so far as I have had an opportunity of observing.

Geographical Distribution.—As in Liliaceæ, Iridaceæ, and Amaryllidaceæ, Hypoxidaceæ has its head quarters in the Cape flora, which contains 37 out of 64 known species. The tribe belongs to the warm temperate zone in the southern hemisphere; but the genus *Molineria* is tropical, and also the section of *Curculigo* with perennial root-stocks and consolidated stigmas. Altogether there are 15 species in Tropical Africa, two of which are the same as occur at the Cape, including 4 in Abyssinia and Nubia, 4 in the Mascarene Isles, and 7 in Angola. Sixty species belong to the Old World, whilst America has four only. No known species extends its range from one continent to another; and Hypoxidaceæ are entirely absent from Europe, Polynesia, Northern and Central Asia, and extra-tropical South America.

Table showing the Geographical Distribution of the Hypoxidaceæ.

Genera.	Cape.	Tropical Africa.	Asia.	Australia.	America.	Total number of Species.
1. *Hypoxis*..	34	11	1	5	3	51
2. *Molineria*	..	1	4	1	..	5
3. *Curculigo*	2	3	2	1	1	7
4. *Pauridia*	1	..	..	..	..	1
	37	15	7	7	4	64

General Character of Hypoxidaceæ.

Perianthii superi tubus supra ovarium nullus vel breviter productus infundibularis vel longe productus filiformis, limbi segmentis regularibus flore expanso patulis subæqualibus oblongis vel lanceolatis, exterioribus sæpe paulo angustioribus acutioribus

dorso viridulis pilosis. *Stamina* 6, vel in *Pauridia* 3, epigyna vel ad faucem tubi uniserialiter inserta, filamentis brevibus filiformibus vel incrassatis, antheris linearibus vel lanceolatis basifixis vel leviter versatilibus, prope margines longitudinaliter introrsum dehiscentibus. *Ovarium* inferum triloculare, ovulis in loculo plurimis superpositis; stylus simplex, vel in *Pauridia* 6-fidus, stigmatibus tribus coalitis vel discretis. *Fructus* capsularis operculatus valvis tribus indehiscentibus vel loculicide dehiscentibus vel indehiscens plus minusve baccatus, septis interdum evanidis spurie unilocularis. *Semina* anatropa turgida minuta superposita, testa crassa crustacea atra vel atro-castanea, albumine carnoso, embryone recto axili, funiculo et foramine prominente, birostellata.—*Herbæ acaules sæpissime pilosæ (pilis sæpe setosis, interdum stellatis, nunquam glanduliferis), cormis parvis monocarpicis vel tuberibus magnis duris polycarpicis foliorum delapsorum vestigiis fibrosis vel membranaceis coronatis, foliis synanthiis linearibus vel lanceolatis raro cuneatis bifidis sessilibus vel petiolatis persistentibus interdum plicatis, scapis productis vel subnullis, floribus solitariis vel paucis corymbosis vel racemosis vel interdum multis dense capitatis sæpissime luteis, interdum albidis, rarissime rubris, bracteis persistentibus lineari-setaceis vel lanceolatis.*

CLAVIS GENERUM.

* *Perianthii tubus supra ovarium nullus vel brevissimus. Stamina epigyna.*

1. Hypoxis. Fructus capsularis circumscissus operculatus. Folia sessilia haud plicata. *C. B. Spei, Afric. trop., Asia australis, America.*
2. Molineria. Fructus baccatus. Folia petiolata plicata. *Asia trop., Australia bor., Ins. Seychell.?*

** *Perianthii tubus supra ovarium productus. Stamina perigyna.*

3. Curculigo. Tubus elongatus filiformis. Stamina 6. *Reg. trop. utriusque orbis, C. B. Spei.*
4. Pauridia. Tubus brevis infundibularis. Stamina 3. *C. B. Spei.*

1. Hypoxis, *Linn.*

Linn. Gen. no. 417 (*ex parte*); *Endl. Gen.* no. 1264; *Herbert, Amaryll.* 65; *Roem. et Schultes, Syst. Veg.* vii. 46, 759; *Salisb. Gen.* 44.—Fabricia, *Thunb. in Fabric. Iter Norv.* 29.—Ianthe *et* Spiloxene, *Salisb. Gen.* 44.—Franquevillea, *Zollinger Cat.* 71.

Perianthii tubus supra ovarium haud productus; segmenta interiora oblonga, exteriora lanceolata dorso viridula sæpe villosa. *Stamina* 6 epigyna limbo breviora, filamentis brevibus erectis, antheris linearibus basifixis vel lanceolatis leviter versatilibus. *Ovarium* inferum triloculare, ovulis in loculo 4–20, stylus brevis subulatus, stigmatibus in capitulum oblongo-trigonum concretis vel lanceolatis plus minusve discretis. *Capsula* medio circumscissa operculata membranacea turbinata vel clavata, septis interdum evanidis, evalvis vel loculicide trivalvis, seminibus minutis globosis sæpissime lucidis atro-castaneis.—*Herbæ acaules, cormis annuis parvis vel tuberibus magnis succo flavo, foliis* 3–20 *sessilibus haud plicatis graminoideis vel rigide coriaceis trifariis vel multifariis sæpissime pilosis, pedunculis foliis brevioribus sæpissime villosis, floribus solitariis corymbosis vel racemosis nunquam capitatis luteis albidis vel rarissime rubris.*

Subgenus IANTHE. Planta tota glaberrima. (Cormi semper parvi monocarpici. Antheræ lineares, basifixæ. Stigmata plus minus discreta.) *Ianthe* et *Spiloxene*, Salisb.

Grandiflora .... 1. *H. stellata.*
Parvifloræ
  Perianthii limbus albus.
    Pedicelli sæpissime uniflori .... 2. *H. minuta.*
                                                3. *H. alba.*
    Inflorescentia umbellata .... 4. *H. aquatica.*
  Perianthii limbus luteus.
    Capenses.
      Folia subteretia.......................... 5. *H. serrata.*
      Folia lata .... 6. *H. ovata.*
                                                7. *H. Andrewsii.*
    Australienses.
      Capsula oblonga vel subglobosa ...... 8. *H. pusilla.*
                                                9. *H. glabella.*
      Capsula clavata........................... 10. *H. occidentalis.*

Subgenus EUHYPOXIS. Planta plus minus villosa. (Ovarium sæpissime pilis setosis erecto-patentibus dense vestitum. Folia sæpissime pilosa. Tubera parva vel magna. Antheræ sæpissime leviter versatiles basi sagittatæ. Stigmata sæpissime concreta.) *Hypoxis*, Salisb., *Platyzyga*, Lallem.

Perianthium rubrum .... 11. *H. Baurii.*
Perianthium album .... 12. *H. milloides.*
13. *H. platypetala.* 14. *H. membranacea.*
Perianthium luteum.
Parvifloræ, foliis linearibus vel subteretibus.
Americanæ.................................... 15. *H. juncea.*
16. *H. erecta.* 17. *H. decumbens.*
Australienses... 18. *H. hygrometrica.* 19. *H. marginata.*
Asiatica .... 20. *H. aurea.*
Africanæ.
Folia subteretia.
21. *H. monanthos.* 22. *H. filiformis.*
23. *H. canaliculata.* 24. *H. Kraussiana.*
Folia linearia.
Pedunculi uniflori.
25. *H. graminea.* 26. *H. Schimperi.*
Flores corymbosi.
Folia rigidula .... 27. *H. Gerrardi.*
28. *H. argentea.* 29. *H. cuanzensis.*
Folia graminoidea .... 30. *H. angustifolia.*
31. *H. sericea.* 32. *H. Zeyheri.*
Flores racemosi.
33. *H. Arnottii.* 34. *H. Jacquini.*
Parvifloræ, foliis lanceolatis.
Uniflora... 35. *H. parvula.*
Inflorescentia corymbosa.
36. *H. setosa.* 37. *H. villosa.*
Inflorescentia racemosa .... 38. *H. obtusa.*
39. *H. polystachya.* 40. *H. latifolia.*
Grandifloræ, foliis angustis.
Inflorescentia corymbosa.
41. *H. longifolia.* 42. *H. Ludwigii.*
Inflorescentia racemosa .... 43. *H. angolensis.*
44. *H. rigidula.* 45. *H. iridifolia.*
Grandifloræ, foliis latis.
Inflorescentia corymbosa vel racemoso-corymbosa.
46. *H. microsperma.* 47. *H. multiceps.*
48. *H. stellipilis.* 49. *H. Rooperi.*
Inflorescentia racemosa.
50. *H. hemerocallidea.* 51. *H. costata.*

1. H. STELLATA, *Linn. Suppl.* 197; *Thunb. Prodr.* 60; *Fl. Cap.* edit. ii. 304; *Roem. et Schultes, Syst. Veg.* vii. 776.—Fabricia stellata, *Thunb. in Fabric. Iter Norv.* 27; *Houttuyn, Handl.* xii. 119, tab. 81, fig. 1.—Amaryllis capensis, *Linn. Sp. Plant.* edit. ii. 420.

Var. 1. ALBIFLORA.—H. stellata α, *Thunb. in Fl. Cap.* loc. cit. Cormus globosus 6–9 lin. crassus, fibris duris densis vestitus. Folia producta 4–6 anguste linearia subcoriacea ubique glaberrima siccitate nigrescentia 4–8 poll. longa medio 1½–2 lin. lata, facie canaliculata, basi lanceolata, margine scabra. Pedunculi 1–6ni stricti graciles uniflori raro biflori 6–9 lin. longi, bractea unica lineari acuminata amplexicauli 1½–3 poll. longa infra medium prædita. Ovarium clavatum glabrum 4–9 lin. longum. Perianthii limbus 6–12 lin. longus, segmentis lanceolatis acutis facie albidis, basi immaculatis, dorso viridulis vel rubro tinctis. Antheræ basifixæ lineares luteæ 4–6 lin. longæ, filamentis brevissimis. Stigmata linearia superne discreta. Capsula turbinata membranacea infra collum circumscissa, seminibus minutis atris. *C. B. Spei, in arenosis,* Thunberg! Burchell, 8572! Drège, 2657!—H. ELATA, *Roem. et Schultes, Syst. Veg.* vii. 778, *non Hook. fil.*, est forma elata grandiflora hujus varietatis.

Var. 2. H. ELEGANS, "*Andr.*"; *Poir. Encyc. Suppl.* iii. 112.—H. stellata, var.? elegans, *Pers. Syn.* i. 362.—H. stellata, *Jacq. Ic.* t. 368; *Andr. Bot. Rep.* t. 236; *Bot. Mag.* t. 1223; *Flore des Serres*, t. 1027.—H. tridentata, *DC. in Red. Lil.* sub t. 169; *Roem. et Schultes, Syst. Veg.* vii. 777.—H. pavonina, *Salisb. Gen.* 44.—H. cærulescens, *DC. in Red. Lil.* sub t. 169; *Roem. et Schultes, Syst. Veg.* vii. 778. Varietas pulchra robusta grandiflora, perianthii segmentis 12–18 lin. longis basi distincte nigro vel nigro-fusco vel nigro-cæruleo maculatis. Antheræ sæpe nigrescentes, polline flavo. *C. B. Spei,* Thunberg! Masson! Oldenburg! Drège! Pappe! etc.

Var. 3. H. GAWLERI, *Baker.*—H. stellata, *Bot. Mag.* t. 662; *DC. in Red. Lil.* t. 169; *Andr. Bot. Rep.* t. 101. Varietas grandiflora robusta, perianthii segmentis facie luteis basi nigro-maculatis. *C. B. Spei.* Masson in Hort. Kew. introduxit anno 1778.

Var. 4. H. LINEARIS, *Andr. Bot. Rep.* t. 171; *Poir. Encyc. Suppl.* iii. 112; *Roem. et Schultes, Syst. Veg.* vii. 769.—H. serrata β, *Gawl. in Bot. Mag.* t. 917.—H. stellata β, *Thunb. Fl. Cap.* loc. cit.—H. tabularis, *Ecklon, Topog. Verz.* 10; *Roem. et Schultes, Syst. Veg.* vii. 769.—Ianthe linearis, *Salisb. Gen.* 44. Varietas gracilis, foliis angustioribus, perianthii segmentis facie luteis immaculatis. *C. B. Spei,* Thunberg! Drège! etc. H. JUNCEA, *Ecklon, Topog. Verz.* 10, *Roem. et Schultes, Syst. Veg.* vii. 769, est forma robusta grandiflora hujus varietatis.

2. H. MINUTA, *Linn. fil. Suppl.* 197; *Thunb. Prodr.* 59; *Fl. Cap.* edit. 2, 303; *Roem. et Schultes, Syst. Veg.* vii. 773.—Helonias minuta, *Linn. Mant.* 225.—Hypoxis pumila, *Linn. Encyc.* iii. 184.—

H. triflora, *Harvey, MSS.* Cormus globosus 2–3 lin. crassus basi applanatus fibris setosis dense vestitus. Folia producta 3–4 anguste linearia suberecta glabra facie canaliculata 1–2 poll. longa $\frac{1}{2}$–1 lin. lata acuminata. Pedunculi solitarii vel gemini 1–2 poll. longi gracillimi glabri simplices uniflori vel profunde furcati biflori, bracteis setaceis basi linearibus. Ovarium obconicum glaberrinum 1 lin. longum. Perianthii limbus albidus 2–3 lin. longus, segmentis oblongo-lanceolatis glabris, exterioribus dorso viridulis. Stamina limbo duplo breviora, antheris linearibus basi sagittatis, filamentis brevissimis. Stigmata antheris breviora. Capsula globosa medio circumscissa. *C. B. Spei in ericetis,* Thunberg! Pappe! Burke! Zeyher, 1665! Ecklon & Zeyher, Hypox. 17! Habitus omnino *Pauridiæ hypoxidoidis,* sed facile distinguitur staminibus 6, ovario obconico brevi et perianthii tubo nullo.

3. H. ALBA, *Linn. fil. Suppl.* 198; *Thunb. Prodr.* 60; *Fl. Cap.* edit. ii. p. 303; *Jacq. Collect.* iv. 135, tab. 2. fig. 1; *Fragm.* 13, t. 7. fig. 4; *Roem. et Schultes, Syst. Veg.* vii. 774.—H. affinis, *Roem. et Schultes, Syst. Veg.* vii. 774.—H. dubia, *Roem. et Schultes, Syst. Veg.* vii. 775.—H. obliqua, *Ecklon et Zeyher, Exsic.* 78. 4, *non Jacq.*—H. crassifolia, *Pappe, MSS.* Cormus globosus 3–4 lin. crassus, setis rigidis densissimis ascendentibus vestitus. Folia producta 3–4 subcoriacea glabra subteretia facie canaliculata 1–3 poll. longa suberecta vel falcata siccitate nigrescentia. Pedunculus gracilis glaber 2–4-pollicaris sæpissime simplex uniflorus, bracteis 1–2 linearibus amplexicaulibus infra medium præditus, interdum furcatus biflorus. Ovarium clavatum glaberrimum 3–4 lin. longum. Perianthii limbus albus 5–6 lin. longus, segmentis lanceolatis acutis $1\frac{1}{2}$–2 lin. latis ubique glabris, exterioribus angustioribus dorso viridulis interdum rubellis. Antheræ lineares flavæ basifixæ $1\frac{1}{2}$–2 lin. longæ, filamentis albidis antheris 3–4-plo brevioribus. Stigmata staminibus breviora. Capsula membranacea glabra 5–6 lin. longa infra collum circumscissa, seminibus plurimis globosis lucidis nigro-castaneis. *Cap. B. Spei in planitiebus,* Thunberg! Sieber, 126! Zeyher, 4132! Harvey, 104, 105! Drège, 2395! Burchell, 8570! Bolus, 2813! etc.

Var. GRACILIS, *Baker.*—H. alba, *Lodd. Bot. Cab.* t. 1074. Gracilior, uniflora, foliis filiformibus, perianthii segmentis omnibus lanceolatis acutis. *C. B. Spei,* Zeyher, 4131! Burchell, 4290! 5495! Macowan, 1222!

Var. BURKEI, *Baker.*—H. alba γ, *Thunb. Fl. Cap.* edit. ii. 304. Varietas robusta aquatilis ad *H. aquaticam* accedens, foliis basi valde dilatatis, pedunculis pluribus profunde furcatis, bracteis $1\frac{1}{2}$–2 poll. longis, ovario cylindrico 9–12 lin. longo in collum sterile perspicuum attenuato. *C. B. Spei,* Thunberg! *Ad flumen Wageboom,* Burke!

4. H. AQUATICA, *Linn. fil. Suppl.* 197; *Willd. Sp. Plant.* ii. 108;

Roem. et Schultes, Syst. Nat. vii. 776. Cormus parvus globosus, fibris radicalibus gracilibus copiosis præditus. Folia producta 4–6 glabra membranacea utrinque glabra, facie canaliculata, pedalia vel sesquipedalia, medio 2–3 lin., basi 5–6 lin. lata. Pedunculi debiles glabri pedales vel semipedales, floribus umbellatis. Umbellæ 5–6-floræ, bracteis linearibus membranaceis 1–2 poll., pedicellis 1–3 poll. longis. Ovarium cylindricum glabrum 6–7 lin. longum. Perianthii limbus 6–9 lin. longus, segmentis lanceolatis vel oblongis 2–3 lin. latis albidis, exterioribus dorso viridulis ubique glabris. Antheræ lineares basifixæ 2–2½ lin. longæ, filamentis subnullis. Stigmata subdiscreta staminibus breviora. Capsula cylindrica membranacea 9–10 lin. longa, seminibus permultis subglobosis lucidis nigro-castaneis ⅛ lin. longis. *C. B. Spei in aquosis,* Thunberg! Oldenburg! Drège 8515, *a, b*! Ecklon et Zeyher 76. 9; Bolus 2814! Mader 172! etc. *Namaqua-land,* Rev. H. Whitehead!

5. H. SERRATA, *Linn. Suppl.* 197; *Thunb. Prodr.* 60; *Fl. Cap.* edit. ii. 304; *Jacq. Ic.* t. 369; *Gawl. in Bot. Mag.* t. 709 (excl. var. β); *Roem. et Schultes, Syst. Veg.* vii. 768.—H. luzulæfolia, *Eckl. Topog. Verz.* 10, *non DC.*—Ianthe serrata, *Salisb. Gen.* 44. Cormus globosus 3–4 lin. crassus, fibris gracilibus dense vestitus. Folia producta 6–12 anguste linearia subcoriacea viridia glabra 3–6 poll. longa, facie canaliculata, medio ½–1 lin. lata, margine obscure serrulata. Pedunculi 1–5ni gracillimi glabri uniflori 2–4-pollicares, bracteis 1–2 parvis setaceis infra medium præditi. Ovarium glabrum clavatum 3–4 lin. longum. Perianthii limbus 6–8 lin. longus, segmentis lanceolatis acutis, facie luteis, basi immaculatis, dorso glabris viridulis, margine sæpe rubro tinctis. Stamina limbo subduplo breviora, antheris luteis basifixis, filamentis brevissimis. Stigmata lanceolata, superne discreta. *C. B. Spei,* Thunberg! Oldenburg! Ecklon et Zuyher 649! &c. V. v. in Hort. Kew.; Dunstan introduxit. Vix nisi varietas *H. stellatæ.*

6. H. OVATA, *Linn. fil. Suppl.* 179; *Thunb. Prodr.* 60; *Fl. Cap.* edit. ii. 306; *Ker in Bot. Mag.* t. 1010; *Roem. et Schultes, Syst. Veg.* vii. 771.—Ianthe ovata, *Salisb. Gen.* 44. Cormus globosus 6–8 lin. crassus, fibris crassis duris dense vestitus. Folia producta 6–8 lanceolata acuta falcata membranacea 2–3 poll. longa 3–6 lin. lata ubique glabra, venis perspicuis verticalibus 10–15. Pedunculi 1–3ni simplices uniflori gracillimi glabri 1–3 poll. longi. Ovarium turbinatum glabrum 1½ lin. longum. Perianthii limbus 3–4 lin. longus, segmentis lanceolatis acutis 1–1½ lin. latis flavis rubro tinctis, exterioribus dorso viridulis glaberrimis. Stamina limbo duplo breviora, antheris linearibus basifixis 1½ lin. longis, filamentis brevissimis. Stigmata 1½–2 lin. longa linearia subdiscreta. *C. B. Spei,* Thunberg! Oldenburg! Drège 1555! Zeyher 4135!

7. H. Andrewsii, *Baker*.—H. obliqua, *Andr. Bot. Rep.* t. 195, *non Jacq.* Fibri radicales perplurimi graciles. Folia 5–6 glabra lanceolata acuta 3–4 poll. longa, deorsum 5–6 lin. lata. Pedunculi terni glabri 2–3-flori 1–1½ poll. longi. Bracteæ lanceolatæ 1–1½ poll. longæ, pedicellis æquilongæ. Ovarium glabrum clavatum 4–4½ lin. longum. Perianthii limbus 6–8 lin. longus, segmentis facie luteis, dorso glabris viridulis. Stamina limbo subduplo breviora, antheris linearibus basifixis. *C. B. Spei*, Hort. Hibberd, anno 1801. (Non vidi.)

8. H. pusilla, *Hook. fil. Fl. Tasm.* ii. 36, t. 130 B; *Handb. New Zeal.* 275; *Benth. Fl. Austral.* vi. 450, *non H. B. K.* Cormus globosus 3–4 lin. crassus, setis duris densis coronatus, fibris radicalibus filiformibus vel cylindricis. Folia producta 3–4 subulata glabra suberecta 2–4 poll. longa, medio ¼–½ lin. lata, facie canaliculata. Pedunculi 1–4ni 6–24 lin. longi gracillimi glabri sæpissime uniflori, bracteis minutis setaceis. Ovarium oblongo-clavatum glabrum 1–1½ lin. longum. Perianthii limbus 1½–3 lin. longus, segmentis lanceolatis acutis, facie luteis, dorso viridibus glabris. Stamina perianthio subduplo breviora, antheris linearibus basifixis, filamentis brevissimis. Stigmata lanceolata discreta. Capsula obovoidea vel globosa 1½–2 lin. longa, medio circumscissa, demum irregulariter trivalvis. *Nova Zelandia, Tasmania, Victoria.*

9. H. glabella, *R. Br. Prodr.* 289; *Roem. et Schultes, Syst. Veg.* vii. 771; *Hook. fil. Fl. Tasm.* ii. 36, t. 130 A; *Benth. Fl. Austral.* vi. 450.—H. vaginata, *Schlecht. in Linnæa*, xx. 568. Cormus globosus 3–4 lin. crassus, setis rigidis duris copiosis coronatus, fibris radicalibus carnosis cylindricis. Folia producta 3–6 suberecta anguste linearia glabra 2–6 poll. longa, medio 1 lin. lata, facie canaliculata, basi lanceolata scariosa. Pedunculi 1–3ni glabri sæpissime simplices uniflori, raro furcati, infra medium bractea lineari amplexicauli præditi. Ovarium oblongo-turbinatum glabrum 1½–2 lin. longum. Perianthii limbus 3–6 lin. longus, segmentis lanceolatis acutis facie flavis, dorso glaberrimis viridulis vel margine rubro tinctis. Stamina perianthio triente breviora, antheris linearibus luteis basifixis 2–3 lin. longis, filamentis filiformibus ½–1 lin. longis. Stigmata lanceolata subdiscreta. Capsula oblongo-turbinata 2–4 lin. longa, infra collum circumscissa, valvis haud dehiscentibus. *Tasmania, Australia australis et orientalis.*

10. H. occidentalis, *Benth. Fl. Austral.* vi. 451. Cormus globosus 2–4 lin. crassus setis duris densis coronatus, fibris radicalibus carnosis cylindricis. Folia producta 3–5 glabra anguste linearia 4–8 poll. longa, medio ½–1 lin. lata, facie canaliculata basi lanceolata scariosa. Pedunculi 3–6 lin. longi glabri gracillimi simplices uniflori vel inter-

dum furcati biflori, bracteis 1–2 lanceolatis amplexicaulibus 1–1½ poll. longis præditi. Ovarium glabrum clavatum 4–8 lin. longum, medio 1 lin. crassum. Flores interdum tetrameri. Perianthii limbus 3–6 lin. longus, segmentis lanceolatis acutis, facie luteis, dorso glabris viridulis. Stamina perianthio duplo breviora, antheris luteis basifixis 1½–2 lin. longis. Stigmata lanceolata subdiscreta. Capsula clavata. *Australia occidentalis*, Drummond! Muir! Miss Warburton.—H. LEPTANTHA, *Benth. Fl. Austral. loc. cit.*, est verisimiliter varietas gracilis hujus speciei perianthii segmentis angustioribus inæqualibus, antheris alternis minoribus, stigmatibus longioribus.

11. H. BAURII, *Baker in Trimen Journ.* 1876, 181. Tuber annuum oblongum 3–4 lin. crassum, fibris setosis copiosis coronatum. Folia producta 5–6 linearia erecta subcoriacea 1½–2 poll. longa, 1½–2 lin. lata, acuta, pilis ascendentibus albidis ½–1 lin. longis ubique vestita. Pedunculi gemini simplices uniflori foliis paulo longiores graciles, pilis ascendentibus prorsus vestiti, bracteis 1–2 perminutis subulatis præditi. Ovarium clavatum 2 lin. longum albido-tomentosum et pilis setosis albidis erecto-patentibus densis 1 lin. longis vestitum. Perianthii limbus saturate rubellus 5–6 lin. longus, segmentis oblongis obtusis 2–3 lin. latis, exterioribus dorso parce setosis. Genitalia perparva. *Kaffraria transkeiana ad montem Baziya, alt.* 3500–4000 *pedum*, Rev. R. Baur! (MacOwan 501). V. v. in hort. Leichtlin.

12. H. MILLOIDES, *Baker*. Tuber annuum oblongum 2–3 lin. crassum. Folia producta 6–10 erecta anguste linearia, facie canaliculata, 1¼–4 poll. longa, basi 2–3 lin., medio 1 lin. lata, matura glabra subtiliter 8–12-costata, juniora pilis paucis setosis erecto-patentibus prædita. Pedunculi solitarii erecti uniflori 1–2 poll. longi, pilis paucis albidis subadpressis superne vestiti. Ovarium turbinatum 2 lin. longum, pilis brevibus albidis setosis ascendentibus ubique vestitum. Perianthii limbus albidus 5–7 lin. longus, segmentis oblongis vel obovato-oblongis obtusis 2–3 lin. latis utrinque glabris. Stamina limbo 3–4plo breviora, antheris minutis lanceolatis, filamentis brevissimis. *Natalia*, Krauss 24! *Montes fluminis Klip, alt.* 3500–4500 *pedes*, Dr. Sutherland! *Dargle Farm*, Mrs. Fannin 58, in Herb. Trin. Coll. Dubl.!

13. H. PLATYPETALA, *Baker*. Tuber annuum oblongum 2 lin. crassum, fibris radicalibus carnosis cylindricis præditum. Folia producta 5–6 erecta linearia subcoriacea 1½–3 poll. longa, 1½–2 lin. lata, pilis albidis setosis ascendentibus ½ lin. longis ubique vestita. Pedunculi solitarii graciles foliis æquilongi, prorsus pilis consimilibus vestiti. Ovarium turbinatum 2 lin. longum, pilis consimilibus dense vestitum. Perianthii limbus albidus 6–7 lin. longus, segmentis oblongis vel obovato-oblongis obtusis utrinque glabris. Stamina limbo 4–5plo

breviora, filamentis brevissimis, antheris minutis lanceolatis. *Natalia, ad montes, alt.* 5000 *pedes,* Dr. Sutherland! McKen! Mrs. Fannin!

14. H. MEMBRANACEA, *Baker.* Tuber globosum 3 lin. crassum, collo elongato, foliis exterioribus haud productis brunneis membranaceis. Folia producta 4 membranacea lanceolata acuta 3–4 poll. longa, medio 6–7 lin. lata, plana utrinque tenuiter simpliciter pilosa, venis tenuibus immersis. Pedunculi 1–2ni biflori 1½–2 poll. longi gracillimi ubique pilosi, bracteis minutis setaceis, pedicellis corymbosis gracillimis pilosis 6–12 lin. longis. Ovarium turbinatum 1 lin. longum, pilis albidis setosis ascendentibus dense vestitum. Perianthii limbus "albidus" (Gerrard) 2–3 lin. longus, segmentis lanceolatis acutis, exterioribus dorso viridibus pilosis. Stamina limbo duplo breviora, antheris lanceolatis versatilibus filamento filiformi æquilongis. Capsula subglobosa magnitudine pisi. *Natalia in ditione fluminis Tugela,* Gerrard et McKen 1835.

15. H. JUNCEA, *Smith, Spicil.* t. 16; *Pursh, Fl. Amer. Sept.* 224; *Roem. et Schultes, Syst Veg.* vii. 761.—H. filifolia, *Elliott, Bot. South Car.* 397. Tuber globosum 2–3 lin. crassum, foliis haud productis, exterioribus brunneis, scariosis coronatum, fibris radicalibus carnosis cylindricis. Folia producta 3–6 filiformia rigidula 6–9 poll. longa ⅛ lin. lata obscura pilosa vel calvata 3–5-nervata venis et marginibus incrassatis. Scapi 1–3ni 1–3-flori gracillimi 2–6 poll. longi, inferne nudi, superne parce pilosi, bracteis minutis setaceis. Ovarium clavato-turbinatum 1½–2 lin. longum, dense pilosum. Perianthii limbus 5–6 lin. longus, segmentis lanceolatis acutis facie flavis, exterioribus dorso viridibus dense pilosis. Stamina limbo subtriplo breviora, antheris parvis lanceolatis, basi profunde sagittatis, filamentis filiformibus æquilongis. Stylus subulatus, stigmatibus concretis. *Civitates fœderatæ australes Americæ borealis in pinetis,* Pursh! Chapman! &c.

Var. WRIGHTII, *Baker.* Ovarium parce pilosum. Folia exteriora haud producta, in fibras setosas dissoluta. *Cuba,* C. Wright 239!

16. H. ERECTA, *Linn. Sp. Plant.* edit. ii. 439; *Bot. Mag.* t. 710; *Red. Lil.* t. 355; *Lodd. Bot. Cab.* t. 710; *Roem. et Schultes, Syst. Veg.* vii. 759; *Lall. in Ind. Semen. Petrop.* x. 52.—H. caroliniensis, *Michx. Fl. Bor.-Am.* i. 188.—Ornithogalum hirsutum, *Linn. Sp. Plant.* edit. i. 306. Tuber globosum 3–4 lin. crassum, foliis exterioribus haud productis scariosis coronatum, fibris radicalibus carnosis cylindricis. Folia producta 5–6 linearia modice firma 3–6 poll. longa, medio 1–3 lin. lata, parce pilosa vel calvata. Pedunculi 1–4ni 1–4-flori graciles, deorsum nudi, superne pilis paucis brunneolis adpressis vestiti, bracteis minutis setaceis, pedicellis corymbosis magis pilosis 3–9 lin. longis. Ovarium turbinatum 1½–2 lin. longum, pilis mollibus brunneolis ascendentibus subdense vestitum. Perianthii limbus 4–6 lin. longus,

segmentis oblongis vel oblongo-lanceolatis, facie luteis, dorso viridulis parce pilosis. Stamina perianthio duplo breviora, antheris lanceolatis basi profunde sagittatis, filamentis filiformibus æquilongis. Stylus subulatus 2 lin. longus, stigmatibus concretis. Capsula oblonga 3 lin. longa, medio circumscissa, valvis demum dehiscentibus. *Per civitates fœderatas Americæ borealis orientales late dispersa.*—H. GRAMINEA, *Pursh, Fl. Amer. Sept.* i. 224! est varietas foliis flaccidis pedalibus, floribus parvis.

17. H. DECUMBENS, *Linn. Sp. Plant.* edit. ii. 439; *Amœn. Acad.* v. 396; *Roem. et Schultes, Syst. Veg.* vii. 762; *Seubert in Mart. Fl. Bras.* iii. 51, tab. 7. fig. 1; *Griseb. Flora West Ind.* 585.—Anthericum sessile, *Miller, Icon.* t. 39. fig. 2.—H. mexicana, *Roem. et Schultes, Syst. Veg.* vii. 761.—H. pusilla, humilis, breviscapa, et elongata, *H. B. K. Nov. Gen.* iii. 286, 287.—H. gracilis, *Lehm.*; *Roem. et Schultes, Syst. Veg.* vii. 764. Tuber globosum 3–6 lin. crassum, foliis exterioribus haud productis brunneis scariosis, fibris radicalibus cylindricis. Folia producta 6–12 linearia modice firma 3–12 poll. longa, medio 1–6 lin. lata, parce pilosa vel calvata. Pedunculi 1–4ni 1–4-flori, 2–6 poll. longi, superne pilis ascendentibus mollibus vestiti, bracteis minutis setaceis, pedicellis brevibus dense pilosis. Ovarium anguste clavatum 3–4 lin. longum dense pilosum. Perianthii limbus 3–4 lin. longus, segmentis lanceolatis acutis facie luteis, exterioribus dorso viridibus dense pilosis. Stamina limbo duplo breviora, antheris lanceolatis basi sagittatis, filamentis filiformibus æquilongis. Stylus subulatus, stigmatibus concretis. Capsula clavata, interdum 6–9 lin. longa. *Per Americam tropicalem a Mexico et Cuba ad Bonariam et Peruviam*, Gardner 133! Spruce 5068! Fendler 1565! Mandon 1208! Wright 1515! &c.—H. ELONGATA, *H. B. K.*, est forma magna foliis pedalibus vel semipedalibus.—H. MEXICANA, *R. & S.*, est forma foliis vix ultra 1 lin. latis, pedunculis unifloris.

18. H. HYGROMETRICA, *Labill. Pl. Nov. Holl.* i. 82, t. 108; *R. Br. Prodr.* 289; *Roem. et Schultes, Syst. Veg.* vii. 771; *Hook. fil. Fl. Tasm.* ii. 36; *Benth. Fl. Austral.* vi. 449. Tuber oblongum 3–4 lin. crassum, collo elongato, setis haud coronatum, fibris radicalibus paucis crassis cylindricis. Folia producta 4–8 anguste linearia graminoidea 3–6 poll. longa, medio 1–1½ lin. lata, facie canaliculata, pilis paucis simplicibus prædita, venis nullo modo exsculptis. Pedunculi simplices vel gemini uniflori vel biflori 3–6 poll. longi, superne glabri, deorsum parce pilosi, bracteis minutis setaceis. Ovarium late clavatum glabrum. Perianthii limbus 5–6 lin. longus, segmentis lanceolatis acutis, facie luteis, dorso viridibus glabris. Stamina perianthio subduplo breviora, antheris lanceolatis leviter versatilibus basi profunde sagittatis, filamentis filiformibus antheris subæquilongis. Stylus subulatus 1½–2 lin. longus, stigmatibus concretis. Capsula obovoidea vel

subglobosa 3–4 lin. longa, infra collum irregulariter circumscissa. *Tasmania, Australia australis et orientalis temperata.*

Var. ELONGATA, *Benth. loc. cit.*, est forma laxa foliis interdum pedalibus, pedicellis 3–4-floris.

Var. H. PRATENSIS, *R. Br. Prodr.* 289. Varietas gracilis parviflora 2–3-flora, ovario et perianthii segmentis interdum dorso pilosis. *Queensland &c.*

19. H. MARGINATA, *R. Br. Prodr.* 289; *Roem. et Schultes, Syst. Veg.* vi. 772; *Benth. Fl. Austral.* vii. 451. Tuber globosum 3–4 lin. crassum, setis gracillimis perplurimis coronatum. Folia angusta linearia subcoriacea rigida 2–18 poll. longa, ½–1 lin. lata, parce pilosa, costa et marginibus incrassatis. Scapus filiformis parce pilosus 1–2-florus, 2–4 poll. longus, bracteis minutis linearibus. Ovarium pilosum anguste clavatum. Perianthii limbus 3–4 lin. longus, segmentis lanceolatis acutis, facie luteis, dorso viridulis subglabris. Stamina limbo duplo breviora. *Australia tropicalis borealis,* R. Brown, Schultz 641!

20. H. AUREA, *Lour. Cochin.* 200; *Kurz in Miquel, Ann. Mus. Lug.-Bat.* iv. 178.—H. minor, *D. Don, Prodr. Nep.* 53; *Royle, Ill. Him.* t. 91. fig. 3.—H. Franquevillei, *Miquel, Flor. Ned. Bat.* iii. 586.—H. curculigoides, *Wall. Cat.* 5164.—Curculigo graminifolia, *Nimmo, in Grah. Bomb. Cat.* 215; *Dalz. & Gibs. Bomb. Flora,* 276. Tuber globosum 3–4 lin. crassum, filis foliorum delapsorum coronatum, fibris radicalibus carnosis cylindricis. Folia producta 6–12 anguste linearia parce pilosa vel vetustate calvata 3–12 poll. longa, medio 1½–2 lin. lata, subcoriacea, basi dilatata, lanceolata. Pedunculi 1–4ni 1–4 poll. longi gracillimi 1–2-flori, pilis ascendentibus pallide brunneis vestiti, bracteis parvis setaceis. Ovarium late clavatum 1½–3 lin. longum, pilis mollibus brevibus pallide brunneis subdense vestitum. Perianthii limbus 3–4 lin. longus, segmentis lanceolatis acutis, facie luteis, exterioribus dorso viridibus tenuiter villosis. Stamina limbo duplo breviora antheris lanceolatis, basi sagittatis, filamento subulato æquilongis. Stylus subulatus, stigmatibus concretis. Capsula oblonga vel oblongo-clavata 3–6 lin. longa, valvis demum dehiscentibus. *Regio temperata Himalayæ centralis et orientalis,* Wallich 5164! Griffith 5930! &c. *Concan,* Dalzell! Ritchie 1443! *Japonia,* Oldham 704! *Insulæ Loo-choo,* C. Wright 344! *China,* Hance, 16516! *Cochin China,* Loureiro. *Java, alt.* 5000–6000 *pedum,* Zollinger.

21. H. MONANTHOS, *Baker, in Trans. Linn. Soc.* ser. 2, *Bot.* i. 266. Tuber oblongum 3 lin. crassum, fibris radicalibus cylindricis. Folia producta 4–5 subteretia 4–5 poll. longa, medio ½ lin. lata, pilis albidis tenuter vestita. Pedunculi uniflori 1–3ni gracillimi 1½–2 poll. longi

tenuiter pilosi, bractea minuta lineari prædititi. Ovarium turbinatum sericeum 1 lin. longum. Perianthii limbus 2 lin. longus, segmentis facie luteis, exterioribus dorso viridulis, tenuiter sericeis. Genitalia limbo duplo breviora. Capsula oblonga 3 lin. longa. *Angola in regione temperata ditionis Huillæ,* Welwitsch!

22. H. FILIFORMIS, *Baker.* Tuber globosum 3 lin. crassum, foliis exterioribus haud productis brunneis scariosis, fibris radicalibus filiformibus. Folia producta 6–8 setacea rigidula 3–4 poll. longa, $\frac{1}{3}$–$\frac{1}{2}$ lin. lata, facie canaliculata, marginibus incrassatis, deorsum obscure pilosa. Pedunculi 1–2ni 1–2-flori 2–5 poll. longi gracillimi, inferne nudi, superne pilis paucis adpressis prædititi, bracteis minutis setaceis. Ovarium turbinatum 1$\frac{1}{2}$–2 lin. longum dense breviter setosum. Perianthii limbus 3–4 lin. longus, segmentis facie luteis, interioribus oblongis, exterioribus lanceolatis acutis dorso viridulis pilosis. Genitalia limbo duplo breviora. *C. B. Spei in ditione Queenstown,* Cooper 462! *Natalia ad montes Mohlamba, alt.* 5000–6000 *pedum,* Dr. Sutherland!

23. H. CANALICULATA, *Baker in Trans. Linn. Soc.* ser. 2, *Bot.* i. 265. Tuber oblongum 9–10 lin. crassum, fibris copiosis coronatum, collo pollicari vel sesquipollicari. Folia plura rigida erecta subteretia 3–6 poll. longa, medio $\frac{1}{2}$ lin. lata, facie canaliculata, inferne pilis paucis vestita, superne calvata. Pedunculi 6–8ni 2-flori 1–1$\frac{1}{2}$ poll. longi, pilis albidis adpressis vestiti, pedicellis 1$\frac{1}{2}$–3 lin. longis dense pilosis, bracteis minutis subulatis. Ovarium turbinatum 2 lin. longum dense albido-setosum. Perianthii limbus 4 lin. longus, segmentis oblongis facie luteis, exterioribus dorso viridulis albo-sericeis. Stamina limbo duplo breviora. Capsula parva turbinata, medio circumscissa. *Angola in regione temperata ditionis Huillæ,* Dr. Welwitsch!

24. H. KRAUSSIANA, *Buchinger in Krauss Beitrage,* 163. Tuber oblongum 1$\frac{1}{2}$–2 poll. crassum, fibris foliorum delapsorum perplurimis in setas dissolutis coronatum. Folia producta 10–15 rigide coriacea pedalia vel semipedalia, medio $\frac{1}{2}$ lin. lata, glabra, facie canaliculata, dorso teretia, basi linearia, venis 7–9 exsculptis. Pedunculi 2–3ni 4–9 poll. longi 2–5-flori, inferne nudi, superne pilis albidis setosis brevibus adpressis vestiti, pedicellis 3–15 lin. longis, bracteis parvis linearibus. Ovarium turbinatum 1$\frac{1}{2}$–2 lin. longum, pilis setosis albidis dense vestitum. Perianthii limbus 5–6 lin. longus, segmentis facie luteis, exterioribus dorso dense albido-sericeis. Genitalia limbo duplo breviora, antheris lanceolatis, basi sagittatis. Capsula parva late turbinata. *Natalia,* Krauss 104! *C. B. Spei,* Drège 8534*a*! Burchell 4099! 4742! MacOwan 2123!

25. H. GRAMINEA, *Willd.*; *Roem. et Schultes, Syst. Veg.* vii. 768. Tuber globosum 3–4 lin. crassum. Folia producta 5–6 anguste linearia

acuminata 1–3 poll. longa, basi 1 lin. lata, modice firma, pilis paucis inconspicuis præsertim ad marginem prædita. Pedunculi pollicares uniflori tenuiter sericei, bracteis minutis subulatis. Ovarium turbinatum 1 lin. longum dense pilosum. Perianthii limbus 2 lin. longus, segmentis lanceolatis, facie luteis, dorso dense sericeis. Stamina limbo duplo breviora, antheris lanceolatis versatilibus. *Madagascaria*, Petit Thouars, Hilsenberg, et Boyer in Herb. Mus. Brit.!

26. H. Schimperi, *Baker*. Tuber oblongum 6–9 lin. crassum, setis copiosis coronatum, fibris radicalibus carnosis cylindricis. Folia producta 4 erecta linearia modice firma glabra 6–9 poll. longa, medio 3 lin. lata, basi dilatata, facie canaliculata, venis leviter exsculptis. Pedunculi 2–3ni uniflori 3–4 poll. longi, inferne glabri, superne tenuiter pilosi. Ovarium 1½ lin. longum turbinatum tenuiter albo-sericeum. Perianthii limbus 4–5 lin. longus, segmentis facie luteis, exterioribus lanceolatis acutis dorso viridibus tenuiter albo-sericeis. Stamina limbo triplo breviora, antheris lanceolatis versatilibus, filamentis æquilongis. Stylus subulatus, stigmatibus concretis. Capsula turbinata 3 lin. longa. *Montes Abyssiniæ, alt.* 8000 *pedum*, Schimper 1118! (anno 1863–8).

27. H. Gerrardi, *Baker*. Tuber non vidi. Folia producta 5–10 linearia rigidula 6–9 poll. longa, medio 2 lin. lata, acuminata, ubique pilis brevibus setosis simplicibus ascendentibus vestita, venis paucis, præsertim marginalibus et intramarginalibus incrassatis, exsculptis, stramineis. Pedunculi 2–3ni 2–3 poll. longi 2–4-flori ubique pilosi, pedicellis corymbosis interdum 12–18 lin. longis, bracteis minutis pilosis linearibus. Ovarium oblongo-clavatum dense pilosum 2 lin. longum. Perianthii limbus 3–4 lin. longus, segmentis facie luteis, interioribus oblongis, exterioribus lanceolatis dorso viridulis dense sericeis. Genitalia perianthio duplo breviora, antheris leviter versatilibus, basi sagittatis. Capsula turbinata 3–4 lin. longa, valvis vetustate solutis. *Natalia ad ripas fluminis Tugela*, Gerrard et McKen 1827! Rev. J. Buchanan!

28. H. argentea, *Harv. MSS.* Tuber oblongum perenne 6–9 lin. crassum foliis exterioribus haud productis brunneis membranaceis, fibris radicalibus carnosis cylindricis. Folia producta 12–18 anguste linearia rigidula 4–6 poll. longa, medio 1 lin. lata, acuminata, ubique subtiliter sericea, marginibus conspicue revolutis, venis haud exsculptis. Pedunculi 1–2ni 2–4-flori 1–2 poll. longi, ubique breviter sericei, pedicellis corymbosis 6–9 lin. longis, bracteis minutis setaceis. Ovarium turbinatum 1½ lin. longum dense sericeum. Perianthii limbus 3–4 lin. longus, segmentis facie luteis, interioribus oblongis, exterioribus lanceolatis dorso dense sericeis. Genitalia limbo duplo breviora. *C. B. Spei in ditione orientali*, MacOwan 50! Burchell 4469! An sit forma campestris *H. sericeæ*?

29. H. CUANZENSIS, *Welw.*; *Baker in Trans. Linn. Soc.* ser. 2, *Bot.* i. 265. Tuber oblongum 1½–2 poll. longum, setis copiosis coronatum, fibris radicalibus carnosis cylindricis. Folia producta 8–10 linearia rigidula pedalia vel sesquipedalia, medio 2 lin. lata, parce pilosa, venulis pluribus exsculptis. Pedunculi 2–4ni 3–5-flori 3–4 poll. longi parce pilosi, pedicellis corymbosis 1½–3 lin. longis, bracteis setaceis pilosis 5–6 lin. longis. Ovarium turbinatum 1½ lin. longum dense pilosum. Perianthii limbus 3 lin. longus, segmentis facie luteis, exterioribus dorso pilosis. Stamina limbo duplo breviora, antheris lanceolatis sagittatis versatilibus. *Angola in ditione Pungo Andongo in pratis humidis*, Dr. Welwitsch!

30. H. ANGUSTIFOLIA, *Lam. Encyc.* iii. 182; *Roem. et Schultes, Syst. Veg.* vii. 767; *Fisch. & Meyer, Ind. Sem. Petrop.* x. 49; *Baker, Flora Maur.* 369.—H. biflora, *Baker in Trimen Journ.* 1876, 181. Tuber oblongum vel globosum 4–9 lin. crassum, cæspitibus unicis vel geminis, foliis exterioribus haud productis brunneis membranaceis, fibris radicalibus gracilibus. Folia producta 6–12 linearia graminoidea modice firma, sæpe 4–6 poll. longa, medio 1½–2 lin. lata, basi lanceolata, obscure pilosa vel calvata, venis nullo modo exsculptis. Pedunculi 1–4ni sæpissime biflori 2–6 poll. longi graciles parce pilosi, pedicellis corymbosis interdum 6–12 lin. longis dense sericeis, bracteis minutis lineari-subulatis. Ovarium turbinatum dense pilosum 1–1½ lin. longum. Perianthii limbus 3–4 lin. longus, segmentis facie luteis, exterioribus lanceolatis acutis dorso viridibus dense pilosis. Stamina limbo duplo breviora, antheris lanceolatis, basi sagittatis, filamento filiformi longioribus. Stylus subulatus, stigmatibus concretis. Capsula turbinata 3–4 lin. longa seminibus globosis opacis ⅔ lin. crassis. *Mauritius*, Commerson, Bojer! etc. *Borbonia*, Dr. I. B. Balfour! *Madagascaria*, Hilsenberg and Bojer! *Zanzibar*, Dr. Kirk! Hildebrant 1060! *Moramballa, alt.* 3000 *pedum*, Dr. Kirk! (forma foliis pedalibus, corymbis 4–5-floris). *Angola*, Dr. Welwitsch! Monteiro! *Kaffraria transkeiana*, Rev. R. Baur 347! *Orange Free State*, Cooper 1039!

Var. BUCHANANI, *Baker*. Varietas grandis flaccida foliis membranaceis calvatis pedalibus, medio 4–5 lin. latis, pedunculis semipedalibus gracillimis glabris, pedicellis 12–18 lin. longis, ovarii pilis longioribus firmioribus. *Natalia*, Rev. J. Buchanan!

31. H. SERICEA, *Baker*. Tuber oblongum 4–8 lin. crassum, cæspitilibus in exemplis nostris semper solitariis, foliis exterioribus atro-brunneis in setas copiosas dissolutis. Folia producta 6–12 linearia semipedalia vel pedalia, medio 1½–2 lin. lata, longe acuminata modice firma facie calvata dorso pilis sericeis adpressis ubique vestita venulis distincte exsculptis. Pedunculi 1–4ni 2–6-flori 3–6 poll. longi dense sericei, pedicellis corymbosis dense sericeis interdum 12–18 lin. longis,

bracteis minutis lineari-subulatis. Ovarium clavato-turbinatum dense brunneo-sericeum $1\frac{1}{2}$–3 lin. longum. Perianthii limbus 4–5 lin. longus, segmentis facie luteis, exterioribus lanceolatis acutis, dorso dense sericeis. Stamina limbo duplo breviora, antheris versatilibus lanceolatis basi sagittatis filamento longioribus. Stylus subulatus, stigmatibus concretis. Capsula globosa turbinata, 3–4 lin. longi, infra collum circumscissa, valvis demum solutis. *C. B. Spei, in ditione orientali*, Zeyher 950! Eckl. & Zeyher 6! Mrs. Barber 708! MacOwan 1593*b*! Bolus 176! etc.

Var. Dregei, *Baker*. Folia rigidiora angustiora (medio $\frac{1}{2}$–1 lin. lata) costa et marginibus valde incrassatis. *C. B. Spei*, Drège 8525! Cooper 1811!

Var. flaccida, *Baker*. Varietas elongata foliis calvatis pedalibus vel sesquipedalibus, pedunculis et pedicellis elongatis. *Albany*, Williamson! *Ad missionem "Seven Fountains,"* Burke!

32. H. Zeyheri, *Baker*. Tuber oblongum 9–12 lin. crassum, setis copiosis coronatum, fibris radicalibus gracilibus. Folia producta 6–10 linearia glabra modice firma 4–6 poll. longa, medio 5–6 lin. lata. Pedunculi gemini 2–3-flori, 2–6 poll. longi, inferne glabri, superne sericei, bracteis setaceis 4–6 lin. longis, pedicellis 6–12 lin. longis. Ovarium turbinatum 2 lin. longum, pilis brevibus sericeis ascendentibus vestitum. Perianthii limbus 5–6 lin. longus, segmentis luteis, exterioribus dorso sericeis. Stamina limbo duplo breviora, antheris lanceolatis $1\frac{1}{2}$ lin. longis, basi sagittatis. Stylus simplex, stigmatibus concretis. *C. B. Spei, in ditione orientali*, Ecklon et Zeyher, Hypox. 7! Williamson! (Herb. Trin. Coll. Dublin).

33. H. Arnottii, *Baker in Gard. Chron.* 1877, ii. 552. Tuber globosum 3–4 poll. crassum, setis copiosis coronatum, fibris radicalibus carnosis cylindricis. Folia 5–6 falcata linearia modice firma semipedalia vel pedalia, medio 3–4 lin. lata, pilis albidis copiosis patulis vel ascendentibus $\frac{1}{2}$ lin. longis utrinque vestita. Pedunculi gemini semipedales graciles arcuati, pilis consimilibus vestiti, floribus 6–8 racemosis, pedicellis inferioribus 3–4 lin. longis, superioribus brevioribus, bracteis linearibus 4–6 lin longis. Perianthii limbus 4–5 lin. longus, segmentis facie luteis, interioribus oblongis, exterioribus lanceolatis dorso viridibus pilosis. Stamina limbo duplo breviora, antheris $1\frac{1}{2}$ lin. longis, basi sagittatis, leviter versatilibus, filamento deltoideo. Stylus subulatus 2 lin. longus, stigmatibus concretis. *C. B. Spei, in ditione Colesberg*, Hort. Kew. anno 1877!

34. H. Jacquini, *Baker*.—H. villosa, *Jacq. Collect. Suppl.* 51, *Ic.* t. 370, *non Thunb.* Tuber oblongum 6–8 lin. crassum, collo elongato, foliis exterioribus haud productis membranaceis. Folia 10–12 linearia pedalia vel semipedalia, medio 2–4 lin. lata, flaccidula, utrinque et ad margines hirsuta. Pedunculi semipedales pilosi, floribus 3–4 racemosis,

pedicellis brevissimis, bracteis linearibus 3–6 lin. longis. Ovarium clavatum 5–6 lin. longum dense pilosum. Perianthii limbus luteus 2–3 lin. longus, segmentis exterioribus dorso pilosis. Stamina limbo duplo breviora, antheris lanceolatis profunde sagittatis. Stylus subulatus, stigmatibus concretis. Capsula clavata 6–9 lin. longa. *C. B. Spei.* (Non vidi.)

35. H. PARVULA, *Baker.* Tuber non vidi. Folia 3–5 lanceolata acuta 1–2 poll. longa, supra basin 3–4 lin. lata, membranacea, utrinque viridia tenuiter pilosa, venis haud exsculptis. Pedunculi 1–2ni uniflori gracillimi 2–3 poll. longi tenuiter pilosi, bracteis nullis. Ovarium 1 lin. longum turbinatum dense villosum. Perianthii limbus 2 lin. longus, segmentis lanceolatis, facie luteis, exterioribus dorso viridibus dense villosis. Stamina valde inæqualia, longiora limbo paulo breviora, antheris lineari-oblongis filamentis suis triplo brevioribus, breviora limbo subduplo breviora, antheris filamento æquilongis. Stylus subulatus, stigmatibus concretis. *Natalia,* Sanderson, anno 1854!

36. H. SETOSA, *Baker.* Tuber oblongum 1–1½ poll. crassum, fibris densissimis setosis 1½–2 poll. longis coronatum. Folia 6–8 lanceolata acuminata subcoriacea haud trifaria 4–6 poll. longa, supra basin 6–12 lin. lata, utrinque glaberrima, venis distincte exsculptis, marginibus obscure ciliolata. Pedunculi bini 2–3-flori 2–3 poll. longi, superne pilis paucis albidis adpressis vestiti, pedicellis corymbosis 6–9 lin. longis, bracteis minutis linearibus. Ovarium turbinatum 1½ lin. longum, pilis albidis ascendentibus sericeis vestitum. Perianthii limbus 4–5 lin. longus, segmentis facie luteis, exterioribus dorso viridibus sericeis. Stamina limbo duplo breviora, antheris lanceolatis basi sagittatis filamento duplo longioribus. Stylus subulatus, stigmatibus concretis. *C. B. Spei,* MacOwan 72 (in Herb. Trin. Coll. Dubl.)! Hort. Kew. anno 1873!

37. H. VILLOSA, *Linn. Suppl.* 198! *Thunb. Prodr.* 60! *Fl. Cap.* edit. ii. 305; *Roem. et Schultes, Syst. Veg.* vii. 765; *A. Rich. Fl. Abyss.* ii. 314, *non Jacq. Ic.* t. 370.—Fabricia villosa, *Thunb. in Fabric. Iter Norv.* 31.—H. tomentosa, *Lam. Ency.* iii. 112; *Roem. et Schultes, Syst. Veg.* vii. 767.—H. Petitiana, *A. Rich. Fl. Abyss.* ii. 315.—H. abyssinica *et* simensis, *Hochst. in Regensb. Flora,* 1844, 32. Tuber oblongum 1–1½ poll. crassum, setis copiosis coronatum, fibris radicalibus pluribus cylindricis carnosis 2–3 poll. longis. Folia producta 12–20 trifaria lanceolata falcata 3–6 poll. longa, medio 5–6 lin. lata, ad apicem sensim acuminata, subcoriacea, venis exsculptis, utrinque pilis simplicibus mollibus ascendentibus albidis vel pallide brunneis ½–1 lin. longis vestita. Pedunculi plures 2–3 poll. longi 2–3-flori dense villosi, bracteis minutis linearibus, pedicellis corymbosis 6–12 lin. longis. Ovarium clavato-obconicum dense villosum 2–3 lin. longum. Perianthii limbus 5–6 lin. longus, segmentis facie luteis,

interioribus oblongis, exterioribus lanceolatis dorso dense villosis. Stamina limbo duplo breviora, antheris lanceolatis $1\frac{1}{2}$ lin. longis basi sagittatis filamento longioribus. Stylus 2 lin. longus, stigmatibus concretis. Capsula turbinata 3–4 lin. longa, medio circumscissa, dense villosa, valvis demum dehiscentibus, seminibus globosis sub lente granulosis $\frac{2}{3}$ lin. longis. *C. B. Spei*, Thunberg! Sonnerat, Drège 2192*a*! Zeyher 4138! 966! Cooper 3237! Burchell 6401! &c. *Ad montes Manganja*, Dr. Meller! *Abyssinia*, Schimper 172!

Var. RECURVA, *Hk. fil. in Journ. Linn. Soc.* vii. 223. Folia calvata 3–4 poll. longa valde falcata. Pedunculi 1–2 poll. longi villosi biflori. *Montes Cameroon, alt.* 7000–8000 *pedum*, Mann 1224! 2133!

Var. H. SOBOLIFERA, *Jacq. Coll. Suppl.* 53, *Ic.* t. 372! *Red. Lil.* t. 170; *Bot. Mag.* t. 711; *Roem. et Schultes, Syst. Veg.* vii. 764; *Fisch. & Meyer, Ind. Sem. Petrop.* x. 51. Tubera aggregata. Elatior, foliis semipedalibus vel pedalibus medio 6–9 lin. latis, pilis simplicibus utrinque vestitis. Scapi semipedales, floribus 4–6 corymbosis, inferioribus 12–18 lin. longis. *C. B. Spei*, Thunberg! etc. V. v. in Hort. Kew.—*H. Krebsii*, Fisch. Ind. Sem. Petrop. xi. 72, ex descriptione non potui segregare.

Var. H. SCABRA, *Lodd. Bot. Cab.* t. 970. Folia semipedalia vel pedalia, facie calvata, subtus et margine pilis simplicibus paucis prædita. Pedunculi elongati 3–5-flori, perianthii segmentis dorso minus villosis. *C. B. Spei*, Bowie! MacOwan 1898! Burchell 3632! 4745! 6307!

Var. H. OBLIQUA, *Jacq. Coll. Suppl.* 54, *Ic.* t. 371; *Roem. et Schultes, Syst. Veg.* vii. 766, *non Andrews*. Varietas robusta foliis latis (supra basin 9–12 lin. latis) oblique tortis margine et carina subtus solum obscure villosis, pedunculis crassis applanatis brevibus 3–5-floris pilis albidis setosis stellatis ascendentibus brevibus dense vestitis. *C. B. Spei*, MacOwan, 1594!

Var. H. PANNOSA, *Baker in Gard. Chron.* 1874, 130. Varietas robusta foliis latis pedalibus ubique pilis longis simplicibus ascendentibus dense vestita. Pedunculi 2–4-flori 3–4 poll. longi dense villosi, pedicellis corymbosis, inferioribus 12–18 lin. longis. Perianthii limbus 6–9 lin. longus. *C. B. Spei*. V. v. in Hort. Kew.

Var. H. CANESCENS, *Fisch. & Meyer, Ind. Sem. Petrop.* x. 50; *Ann. Sc. Nat.* ser. iii. vol. v. 375; *Walp. Ann.* i. 847.—H. villosa, *Linn. Herb. ex parte*!—H. decumbens β et γ, *Thunb. Herb. capense*! *non Linn.* Varietas robusta foliis pedalibus vel semipedalibus ubique pilis stellatis albidis vel pallide vel brunneis $\frac{1}{2}$–1 lin. longis vestita. Pedunculi 2–4-flori dense villosi. *C. B. Spei*, Thunberg! Burchell 3380–2! 3542! MacOwan 1899!

38. H. OBTUSA, *Burchell in Bot. Reg.* tab. 159; *Roem. et Schultes, Syst. Veg.* vii. 765; *Baker in Trans. Linn. Soc.* xxix. 156. Tuber

oblongum 2 poll. crassum setis copiosis coronatum, fibris radicalibus carnosis cylindricis. Folia producta 12–18 trifaria lanceolata acuminata pedalia vel semipedalia, supra basin 6–9 lin. lata, subcoriacea, carina subtus et marginibus pilis brevibus simplicibus setosis albidis ciliata. Pedunculi 3–6 poll. longi, floribus 3–8 racemosis laxe dispositis, pedicellis inferioribus 2–3 lin. longis, bracteis linearibus pedicello longioribus. Ovarium turbinatum 2–3 lin. longum pilis albis ascendentibus setosis dense vestitum. Perianthii limbus 6–8 lin. longus, segmentis facie luteis, interioribus oblongis, exterioribus lanceolatis dorso viridulis villosis. Stamina limbo duplo breviora, antheris lanceolatis versatilibus, basi sagittatis, filamento brevi. Stylus 3 lin. longus, stigmatibus concretis. *C. B. Spei*, Burchell! Bolus 2572! Warrington! Mrs. Barber 685! *Africa tropicalis orientalis æquatorialis*, Col. Grant!

39. H. POLYSTACHYA, *Welw.*; *Baker in Trans. Linn. Soc.* ser. 2, *Bot.* i. 206. Tuber globosum 2–6 poll. crassum, reliquis brunneis membranaceis foliorum delapsorum coronatum. Folia producta 10–12 ensiformia rigidula pedalia vel sesquipedalia, medio 8–9 lin. lata, acuminata, facie calvata, dorso et margine tenuiter pilosa. Pedunculi 6–8ni, 4–6 poll. longi, superne villosi. Racemi densi 20–30-flori 3–4 poll. longi, pedicellis inferioribus 6–12 lin. longis, bracteis villosis lineari-subulatis. Ovarium turbinatum 3 lin. longum, breviter villosum. Perianthii limbus 6 lin. longus luteus, segmentis exterioribus lanceolatis dorso villosis. Stamina limbo duplo breviora, antheris lanceolatis basi sagittatis filamento longioribus. Capsula turbinata 5–6 lin. longa, infra collum circumscissa. *Angola in regione temperata ditionis Huillæ*, Dr. Welwitsch!

Var. ANDONGENSIS, *Baker*. Folia angustiora (medio 5–6 lin. lata), dorso villosiora. Pedunculi acute ancipites. *Pungo Andongo*, Dr. Welwitsch!

40. H. LATIFOLIA, *Hook. in Bot. Mag.* t. 4817. Tuber globosum 2½–3 poll. crassum. Folia producta 6–8 pedalia vel demum bipedalia, medio 1½–2 poll. lata, lanceolata coriacea glabra. Pedunculi 3–4 poll. longi, superne villosi. Racemus bipollicaris 10–12-florus, bracteis linearibus, pedicellis omnibus brevibus. Ovarium turbinatum glabrum 3 lin. longum. Perianthii limbus 6 lin. longus luteus, segmentis interioribus oblongis, exterioribus lanceolatis, viridibus dorso villosis. Stamina limbo paulo breviora, antheris lanceolatis 3 lin. longis. Stylus brevissimus, stigmatibus discretis. *Natalia*, Capt. Garden (Hort. Kew. anno 1854).

41. H. LONGIFOLIA, *Baker in Bot. Mag.* t. 6035. Tuber oblongum 1½–2 poll. crassum. Folia producta 8–9 rigide coriacea pedalia vel semipedalia, medio 1½–2 lin. lata, acuminata, facie canaliculata, basi lanceolata, venis crebris exsculptis, marginibus et carina faciei inferioris

pilis paucis brevibus albidis præditis. Pedunculi gemini 6–9-pollicares 2–4-flori, superne pilis albidis adpressis dense vestiti, pedicellis inferioribus 12–18 lin. longis, bracteis setaceis 6–9 lin. longis. Ovarium turbinatum 2–3 lin. longum, pilis setosis albidis ascendentibus 1–1½ lin. longis dense vestitum. Perianthii limbus 7–8 lin. longus, segmentis luteis, interioribus glabris oblongis, exterioribus lanceolatis dorso dense longe villosis. Stamina limbo triplo breviora, antheris lanceolatis leviter versatilibus 1½ lin. longis. Stylus cylindricus, stigmatibus concretis. Capsula turbinata operculata 4 lin. longa. *Ad sinum Algoa,* Cooper in Hort. Kew. anno 1872! *Fat River,* Burke!

Var. THUNBERGII, *Baker.* Folia ubique pilis ascendentibus simplicibus albidis 1–1½ lin. longis vestita. *C. B. Spei,* Thunberg! (in herbario suo sub nomine *H. villosa,* var. δ).

42. H. LUDWIGII, *Baker in Trimen Journ.* 1876, 181. Tuber oblongum 1–1½ poll. crassum. Folia producta 8–9 linearia pedalia vel sesquipedalia, medio 5–6 lin. lata, subcoriacea, venis pluribus distincte exsculptis, pilis brevibus ascendentibus albidis præsertim ad margines et carinam faciei inferioris prædita. Pedunculi 9–12-pollicares, supra basin dense villosi, pilis simplicibus mollibus albidis 1–1½ lin. longis. Inflorescentia subcorymbosa 4–12-flora, pedicellis inferioribus 12–18 lin. longis, bracteis linearibus 6–12 lin. longis. Ovarium obconicum 2-3 lin. longum, pilis eis pedunculi consimilibus dense vestitum. Perianthii limbus 8–9 lin. longus, segmentis luteis, interioribus oblongis, exterioribus dorso dense longe villosis. Stamina limbo duplo breviora, antheris versatilibus lanceolatis 1½ lin. longis. Stylus 1½ lin. longus, stigmatibus concretis. *C. B. Spei, hort.,* Ludwig in herb. Trin. Coll. Dublin! *Kaffraria transkeiana,* Rev. R. Baur 301!

43. H. ANGOLENSIS, *Baker in Trans. Linn. Soc.* ser. 2, *Bot.* i. 266. Tuber oblongum 1 poll. crassum, setis copiosis coronatum. Folia producta 6–8 linearia acuminata rigidula 6–9 poll. longa, medio 2–3 lin. lata, subtiliter striata, marginibus et costa faciei inferioris pilis albidis præditis. Pedunculi 1–4ni, 3–6 poll. longi, pilis albidis ascendentibus vestiti. Racemus 6–8-florus, 3–4 poll. longus, pedicellis inferioribus 5–6 lin. longis, bracteis linearibus 4–6 lin. longis. Ovarium turbinatum 3 lin. longum pilis setosis ascendentibus dense vestitum. Perianthii limbus 6 lin. longus, segmentis luteis, interioribus oblongis glabris, exterioribus lanceolatis dorso dense villosis. Stamina limbo duplo breviora, antheris lanceolatis basi sagittatis, filamentis brevibus deltoideis. Stylus subulatus, stigmatibus concretis. *Angola in regione temperata ditionis Huillæ,* Dr. Welwitsch!

44. H. RIGIDULA, *Baker.* Tuber oblongum, collo elongato. Folia producta 5–6 linearia pedalia vel sesquipedalia erecta rigide coriacea, medio 3–4 lin. lata, facie canaliculata, venis pluribus exsculptis, pilis albidis brevibus ascendentibus præsertim ad faciem inferiorem vestita.

Pedunculi 2–3ni semipedales vel pedales erecti dense villosi. Racemus 4–8-florus 2–3 poll. longus, pedicellis inferioribus brevissimis, bracteis lineari-setaceis 6–12 lin. longis. Ovarium obconicum 3 lin. longum, pilis setosis albis ascendentibus 1–1½ lin. longis densissime vestitum. Perianthii limbus luteus 6–9 lin. longus, segmentis interioribus oblongis glabris, exterioribus lanceolatis dorso dense villosis. Stamina limbo duplo breviora, antheris lanceolatis leviter versatilibus 1½ lin. longis, filamentis brevissimis. Stylus filiformis, stigmatibus concretis. Capsula turbinata 4 lin. longa operculata dense villosa, valvis haud dissolutis. *C. B. Spei in ditione orientali*, Zeyher 1670! Drège 2194! Burchell 3694! Cooper 883! 1763! 3239! 3241! MacOwan 1649! Hort. Kew. anno 1863!

Var. PILOSISSIMA, *Baker*. Folia utrinque pilis albis simplicibus ascendentibus dense vestita. *Natalia*, Burke 156! Krauss 155! Gerrard 1826!

45. H. IRIDIFOLIA, *Baker*. Tuber non vidi. Folia producta 6–9 erecta linearia 6–15 poll. longa, medio 3–5 lin. lata, e medio ad apicem acuminatum sensim attenuata, rigide coriacea, venis 30–40 crebris leviter exsculptis, ad margines et costam faciei inferioris pilis brevibus albis prædita. Pedunculi 3–4ni erecti 3–10 poll. longi acute ancipites, superne dense villosi. Racemus 6–12-florus 3–4-pollicaris, pedicellis inferioribus 3–6 lin. longis, bracteis setaceis dense villosis. Ovarium turbinatum 3–4 lin. longum, pilis setosis albis ascendentibus 1½ lin. longis densissime vestitum. Perianthii limbus 6–9 lin. longus luteus, segmentis interioribus oblongis glabris, exterioribus lanceolatis dorso dense villosis. Stamina perianthio duplo breviora, antheris lanceolatis basi sagittatis leviter versatilibus 2 lin. longis. Ovarium dense villosum, valvis haud dissolutis. *Africa tropicalis centralis australis*, Baines!

46. H. MICROSPERMA, *Lallem. in Fisch. & Meyer, Ind. Sem. Petrop.* x. 50; *Walp. Ann.* i. 847. Folia subensiformia fere pedalia 5–9 lin. lata, supra glabra, subtus longissime adpresse pilosa. Pedunculi 2–10-flori, pedicellis infimis flore multo longioribus. Inflorescentia corymboso-racemosa. Ovarium turbinatum dense villosum. Perianthii limbus luteus 15–20 lin. latus. Capsula 4½–6 lin. longa, valvis demum dehiscentibus, seminibus globosis ½ lin. crassis sub lente obiter granulosis. *C. B. Spei*, Hort. Petrop. anno 1842. Non vidi. "Similis *H. obliquæ*, Jacq., et *H. scabræ*, Lodd."

47. H. MULTICEPS, *Buchinger in Krauss Beiträge*, 163. Tuber globosum 1½–2 poll. crassum, setis copiosis coronatum, fibris radicalibus elongatis. Folia producta 5–6 lanceolata semipedalia vel pedalia, medio 9–12 lin. lata, rigide coriacea, venis 40–50 gracilibus distincte exsculptis, ubique pilis setosis albidis stellatis brevibus patulis vestita. Pedunculi 1–2ni 3–6 poll. longi 2–4-flori ubique pilis setosis his-

pidi, pedicellis corymbosis, inferioribus 6–9 lin. longis, bracteis parvis linearibus. Ovarium turbinatum 3 lin. longum, pilis setosis erecto-patentibus 1 lin. longis dense vestitum. Perianthii limbus 6–9 lin. longus, facie luteus, segmentis exterioribus dorso dense villosis. Stamina perianthio duplo breviora, antheris lanceolatis basi sagittatis, filamento brevissimo. Stylus subulatus, stigmatibus concretis. *Natalia*, Krauss 248! *C. B. Spei, in ditione orientali*, Drège 3513*d*! MacOwan 104! Cooper in Hort. Kew. anno 1863!

48. H. STELLIPILIS, *Ker in Bot. Reg.* t. 663; *Roem. & Schultes, Syst. Veg.* vii. 767; *Fisch. & Meyer, Ind. Sem. Petrop.* x. 51.—H. lanata, *Eckl. Exsic.* Tuber globosum 2 poll. crassum fibris copiosis coronatum. Folia 12–20 trifaria lanceolata falcata semipedalia vel pedalia, medio 9–12 lin. lata, subcoriacea, supra viridia, subtus albo-incana, pilis elongatis nullis, venis gracillimis immersis. Pedunculi 3–4ni 3–4 poll. longi, 3–8-flori, superne pilis elongatis ascendentibus dense villosi, bracteis linearibus villosis 9–12 lin. longis, pedicellis inferioribus 1–2 poll. longis. Ovarium turbinatum 3 lin. longum pilis albis ascendentibus mollibus 1–1½ lin. longis dense villosum. Perianthii limbus 8–9 lin. longus, segmentis luteis, interioribus oblongis, exterioribus lanceolatis dorso dense villosis. Stamina limbo duplo breviora, antheris lanceolatis leviter versatilibus 2–3 lin. longis. Stylus 2 lin. longus, stigmatibus concretis. Capsula turbinata, medio circumscissa, valvis haud solutis, seminibus opacis leviter compressis ⅔ lin. longis. *C. B. Spei*, Zeyher 4140! Burchell 3303! Drège 8527!

49. H. ROOPERI, *Moore in Gard. Comp.* i. 65, *cum icone*; *Lemaire, Jard.-Fleur.* t. 303. Tuber oblongum 1½–3 poll. crassum reliquis foliorum delapsorum haud setosis. Folia 12–18 trifaria lanceolata pedalia vel sesquipedalia, medio 12–18 lin. lata, longe acuminata, viridia subcoriacea, supra calvata, subtus pilis multis albidis tenuiter vestita, venis permultis gracilibus vix exsculptis. Pedunculi 2–6ni ancipites 5–8-flori 6–9 poll. longi, inferne glabri, superne pilis albidis ascendentibus setosis dense vestiti. Inflorescentia racemoso-corymbosa, bracteis linearibus, pedicellis inferioribus 9–12 lin. longis. Ovarium obconicum 3 lin. longum, pilis setosis ascendentibus dense vestitum. Perianthii limbus 8–10 lin. longus, segmentis interioribus oblongis, exterioribus lanceolatis dorso dense villosis. Stamina limbo duplo breviora, antheris lanceolatis basi sagittatis 3 lin. longis, filamentis lanceolatis 1½ lin. longis. Stylus clavatus, stigmatibus concretis 2 lin. longis. Capsula 4–5 lin. longa dense setosa, medio circumscissa, valvis haud solutis, seminibus globosis atro-castaneis lucidis ¾ lin. crassis. *Natalia*, Dr. Sutherland! Gerrard et M'Ken, 1828! Rev. J. Buchanan! *C. B. Spei in ditione orientali*, Drège 8529! Cooper 154! 3240! (V. v. in Hort. Kew.)

Var. FORBESII, *Baker*. Humilior, floribus minoribus, pedicellis brevioribus, foliis tempore florendi semipedalibus marginibus et carina faciei inferioris solum pilosis. *Ad sinum Delagoa*, Forbes!

50. H. HEMEROCALLIDEA, *Fisch. et Meyer, Ind. Sem. Petrop.* viii. 64, x. 50; *Walp. Ann.* i. 847.—H. elata, *Hook. fil. in Bot. Mag.* t. 5690, *non R. & S.* Tuber globosum 3–4 poll. crassum. Folia plura lanceolata sesquipedalia vel demum 2–3-pedalia deorsum 1½–2 poll. lata sensim acuminata rigide coriacea, facie calvata, dorso et margine breviter pilosa, venis perplurimis distincte exsculptis. Pedunculi terni 6–9 poll. longi ancipites superne dense villosi. Inflorescentia racemosa 6–12-flora, pedicellis inferioribus brevibus, bracteis linearibus 6–9 lin. longis. Ovarium turbinatum 3–4 lin. longum pilis erecto-patentibus albis setosis 1½–2 lin. longis densissime vestitum. Perianthii limbus luteus 8–9 lin. longus, segmentis interioribus oblongis, exterioribus lanceolatis dorso dense villosis. Stamina limbo triente breviora, antheris lanceolatis versatilibus. Stylus simplex; stigmata concreta. Capsula turbinata 5–6 lin. longa infra collum circumscissa, valvis haud dehiscentibus, seminibus globosis atris lucidis. *C. B. Spei, Basuta-land,* Cooper 3242!

51. H. COSTATA, *Baker.* Tuber non vidi. Folia producta 6–8 tempore florendi oblongo-lanceolata semipedalia medio 12–14 lin. lata acuta rigide coriacea, venis permultis valde exsculptis, marginibus incrassatis, ad margines et carinam faciei inferioris pilis setosis albidis erecto-patentibus 1–1½ lin. longis dense ciliata. Pedunculi bini 3–4-flori semipedales pilis setosis ascendentibus dense vestiti, floribus confertis, pedicellis brevissimis, bracteis linearibus setosis dense villosis. Ovarium turbinatum 3 lin. longum, pilis setosis densissime vestitum. Perianthii limbus 6–9 lin. longus, luteus; segmentis exterioribus dorso dense villosis. Stamina limbo duplo breviora, antheris lanceolatis. Stylus simplex; stigmata concreta. *Orange Free State ad montem Nelson's Kop,* Cooper 879!

2. MOLINERIA, *Colla.*

Colla, Hort. Rip. App. ii. 333, t. 18; *Herb. Amaryll.* 84; *Kurz in Ann. Mus. Lug.-Bat.* iv. 174, *ex parte.*—Curculigo, sp., *Dryand. &c.*

Perianthii tubus supra ovarium vix productus; segmenta oblonga lutea, exteriora dorso villosa. *Stamina* 6 epigyna limbo breviora, filamentis brevibus erectis, antheris lanceolatis basifixis. *Ovarium* inferum triloculare, ovulis in loculo pluribus; stylus subulatus; stigmata in capitulum oblongo-trigonum concreta. *Fructus* baccatus indehiscens, perianthii segmentis marcescentibus coronatus, septis evanidis, seminibus globosis atris opacis granulosis. *Herbæ perennes rhizomate obliquo tuberoso præditæ, foliis magnis plicatis lanceolatis longe petiolatis, floribus sæpissime in capitulum densum aggregatis.*

Flores permulti dense capitati.
1. *M. recurvata.* 2. *M. gracilis.* 3. *M. crassifolia.*
Flores pauci laxe racemosi.................... 4. *M. Finlaysoniana.*
Species dubia, floribus magnis paucis ...... 5. *M. rhizophylla.*

1. M. RECURVATA, *Herb. Amaryll.* 84; *Kurz in Ann. Mus. Lug.-Bat.* iv. 175.—Curculigo recurvata, *Dryand. in Ait. Hort. Kew.* edit. 2, ii. 253; *Bot. Reg.* t. 770; *Roxb. Fl. Ind.* ii. 145; *Roem. et Schultes, Syst. Veg.* vii. 757; *Wall. Cat.* 5159; *Benth. Fl. Austral.* vi. 448.—Molineria plicata, *Colla, Hort. Rip. App.* ii. 333, t. 18; *Herb. Amaryll.* 84, *non Kurz.*—Leucojum capitulatum, *Loureiro, Fl. Cochin.* 199 (*nomen antiquum, anno* 1790). Molineria capitulata, *Herb. Amaryll.* 84. Tuber obliquum, fibris radicalibus copiosis carnosis elongatis. Folia longe petiolata; petioli 1–2-pedales plus minusve pilosi inferne dilatati; lamina lanceolata 2–3-pedalis medio 3–6 poll. lata a medio ad apicem et basin sensim angustata modice firma plicata facie glabra subtus glabra vel ad venas ciliata vel raro prorsus tenuiter pilosa. Scapi plures ancipites 3–9 poll. longi, pilis adpressis brunneis villosi, apice cernui, floribus in capitulum deflexum oblongum vel globosum 1–2 poll. longum aggregatis, bracteis lanceolatis dorso villosis 6–15 lin. longis, pedicellis inferioribus 6–9 lin. longis. Ovarium turbinatum 3–4 lin. longum breviter villosum, ovulis in loculo circiter 10. Perianthii limbus 3–4 lin. longus, segmentis exterioribus dorso villosis. Antheræ lanceolatæ $1\frac{1}{2}$–2 lin. longæ, filamentis brevissimis. Bacca globosa 3–4 lin. longa, seminibus atris granulosis $\frac{1}{4}$ lin. longis. *Himalaya orientalis, Zeylania, Malaya, Cochin-China, Formosa, Insulæ Philippinæ et Australia borealis.* M. SULCATA, *Kurz, loc. cit.*, est verisimiliter forma hujus speciei ovarii collo magis angustato. CURCULIGO VILLOSA, *Wall. Cat.* 5163 B (non A), est forma hujus speciei foliis subtus pilosis, ex herbario Finlaysoni.

2. M. GRACILIS, *Kurz in Miquel Ann. Mus. Lug.-Bat.* iv. 177.—Curculigo gracilis, *Wall. Cat.* 5160. Tuber breve obliquum, fibris radicalibus pluribus elongatis. Folia longe petiolata; petioli 1–$1\frac{1}{2}$-pedales, pilis adpressis dense villosi, inferne sensim dilatati; lamina lanceolata 2–3-pedalis medio 2–6 poll. lata modice firma valde plicata utrinque glabra. Scapi ancipites 2–6 poll. longi dense brunneo-tomentosi, apice cernui, floribus in capitulum minus densum quam in *M. recurvata* dispositis, interdum 4–5 poll. longum, bracteis lanceolatis dorso dense villosis 12–18 lin. longis, pedicellis 6–9 lin. longis. Ovarium oblongum 3–4 lin. longum dense brunneo-villosum, collo angustato. Perianthii limbus 5–6 lin. longus, segmentis exterioribus dorso prorsus villosis. Stamina limbo duplo breviora, antheris lanceolatis 2 lin. longis, filamentis brevissimis. Stylus subulatus; stigma

capitatum. *Himalaya orientalis et centralis,* Wallich 5160! Griffith 5936! Hook. fil.! &c.

Var. JAMESONI, *Baker.* Folia rigide coriacea utrinque glabra. Capitulum densum globosum, pedicellis subnullis. *Himalaya centralis,* Jameson!

3. M. CRASSIFOLIA, *Baker.* Petiolus pedalis latus inferne alatus. Folia 2–3-pedalia vel ultra medio 3–6 poll. lata rigide coriacea valde plicata, facie glabra viridia, dorso ubique persistenter albo-tomentosa. Pedunculus crassus anceps tomentosus 2–8-pollicaris, florioribus in capitulum densum oblongum 3–4 poll. longum dispositis, bracteis lanceolatis membranaceis glabris 12–18 lin. longis, pedicellis inferioribus 6–9 lin. longis. Ovarium oblongum 3–4 lin. longum brunneo-sericeum. Perianthii limbus 5–6 lin. longus, segmentis exterioribus dorso leviter pilosis. Stamina limbo duplo breviora, filamentis brevissimis. Bacca oblonga semipollicaris, seminibus atris granulosis globosis $\frac{3}{4}$ lin. longis. *Sikkim ad Myrung et Kala Panee,* Hook. fil. & Thomson, Curculigo, no. 5!

4. M. FINLAYSONIANA, *Baker.*—Curculigo Finlaysoniana, *Wall. Cat.* 5162.—Hypoxis trichocarpa *Wight Ic.* t. 2045; *Thwaites, Enum. Zeyl.* 323; *Kurz in Ann. Mus. Lug.-Bat.* iv. 178.—H. latifolia, leptostachya, pauciflora, *et* brachystachya, *Wight Ic.* t. 2044–2046. Tuber elongatum oblongo-cylindricum, fibris radicalibus multis elongatis. Folia plura distincte petiolata; petiolus 3–12-pollicaris, basi dilatatus, inferne pilosus: lamina lanceolata semipedalis vel pedalis, medio 12–18 lin. lata, a medio ad basin et apicem longe attenuata, chartacea glabra plicata utrinque viridia, venis pluribus distincte exsculptis. Pedunculi brevissimi villosi, floribus 6–30 racemosis, superioribus sterilibus, pedicellis inferioribus 6–12 lin. longis sæpe deflexis, bracteis linearibus acuminatis 6–12 lin. longis. Ovarium clavatum villosum 2–4 lin. longum. Perianthii limbus luteus siccitate brunneus 3–4 lin. longus, segmentis exterioribus dorso villosis. Stamina perianthio paulo breviora, antheris lanceolatis 1 lin. longis basi sagittatis, filamento filiformi æquilongis. Stylus subulatus; stigmata concreta. Bacca oblonga semipollicaris. *Himalaya orientalis, Birma et montes Indiæ peninsularis et Zeylaniæ,* Wallich 5162! Thwaites 2288! &c.

5. M.? RHIZOPHYLLA, *Baker.*—Hypoxis rhizophylla, *Baker, Fl. Maur.* 369. Tuber globosum, fibris radicalibus carnosis. Folia producta plura, petiolis gracilibus glabris semipedalibus vel pedalibus; lamina lanceolata 2–3-pedalis medio $\frac{1}{2}$–4 poll. lata modice firma glabra plicata, apice sæpe radicans. Pedunculus 2–3-florus 2–3 poll. longus dense villosus, bracteis lanceolatis membranaceis acutis 12–18 lin. longis dorso vix villosis, pedicellis brevissimis vel subnullis. Ovarium oblongo-clavatum 3–4 lin. longum dense villosum. Perianthii tubus brevissimus, segmentis lanceolatis 15–18 lin. longis dorso villosis, sic-

citate atro-brunneis. Genitalia imperfecte visa. Fructus ignotus. *Insulæ Sechellenses in rupestribus inundatis*, Horne!

3. Curculigo, *Gærtn.*

Gærtn. Sem. i. 63, t. 16; *Endl. Gen.* no. 1263; *Herb. Amaryll.* 64; *Roem. et Schultes, Syst. Veg.* vii. 45, 755.—Molineria, *Kurz in Ann. Mus. Lug.-Bat.* iv. 175, *ex parte, non Colla.*—Fabricia, *Thunb. ex parte.*—Forbesia, *Eckl. Verz. Top.* 4 (*nomen solum*). —Empodium, *Salisb. Gen.* 43.—Hypoxidis et Gethyllidis sp., *Linn., Jacq.*, &c.

Perianthium. tubo supra ovarium longe producto filiformi, limbi segmentis oblongis vel lanceolatis exterioribus dorso villosis vel glabris. *Stamina* 6 ad tubi faucem uniseriata, filamentis brevissimis, antheris basifixis lanceolatis vel linearibus. *Ovarium* triloculare, ovulis in loculo pluribus; stylus filiformis ex tubo protrusus, stigmata coalita vel discreta. *Fructus* indehiscens subbaccatus tubi basi persistente rostratus, septis teneris sæpe evanidis, seminibus minutis turgidis opacis vel lucidis.—*Herbæ acaules perennes vel annuæ plus minusve pilosæ, foliis plicatis petiolatis vel sessilibus, floribus luteis radicalibus solitariis vel in capitulum densum sessile vel breviter pedunculatum aggregatis, bracteis magnis lanceolatis scariosis persistentibus.*

Flores solitarii radicales.
Annuæ, cormo parvo globoso. (*Empodium*, Salisb., *Forbesia*, Eckl.)
1. *C. plicata*. 2. *C. veratrifolia*.
Perennes, tubere duro magno.
Africana .... 3. *C. gallabatensis.*
Americana .... 4. *C. scorzoneræfolia.*
Flores pauci in spicam radicalem congesti. 5. *C. orchioides.*
Flores multi dense capitulati (habitus *Molineriæ*).
6. *C. seychellensis.* 7. *C. latifolia.*

1. C. plicata, *Dryand. in Ait. Hort. Kew.*, edit. 2, vol. ii. 253; *Roem. et Schultes, Syst. Veg.* vii. 755.—Hypoxis plicata, *Linn. Suppl.* 197; *Thunb. Prodr.* 60; *Fl. Cap.* edit. ii. 305.—Fabricia plicata, *Thunb. in Fabric. It. Norv.* 29.—Gethyllis plicata, *Jacq. Hort. Schoen.* t. 80.—Forbesia plicata *et* angustifolia, *Eckl. Verz. Top.* 4.—Hypoxis luzulæfolia, *DC. in Red. Lil.* t. 260; *Roem. et Schultes, Syst. Veg.* vii. 770. —Empodium plicatum, *Salisb. Gen.* 43. Cormus annuus globosus 6–9 lin. crassus, tunicis fibrosis cancellatis vestitus. Folia producta

3–6 linearia graminoidea glabra vel obscure pilosa plicata 6–9 poll. longa, 1–3 lin. lata. Flores 1–3ni suaveolentes ovariis cylindricis in vagina basali occultis, tubo filiformi glabro vel piloso viridulo 2–6 poll. longo, limbi segmentis luteis lanceolatis 6–12 lin. longis, exterioribus dorso viridibus glabris. Stamina limbo triente vel subdimidio breviora, antheris linearibus 3–5 lin. longis, filamentis brevissimis. Stylus subulatus; stigmata discreta linearia. Capsula oblonga glabra 5–6 lin. longa, tubi basi rostrata, seminibus atris globosis opacis. *C. B. Spei,* Thunberg! Masson! Sieber 124! Burchell 4979! 8451! Zeyher 4141! MacOwan 336! 1874! *Natalia,* Sanderson 263!

Var. Barberi, *Baker.* Folia linearia pedalia et ultra. Pedicelli 1–3 poll. longi ex vaginis basalibus protrusi. Perianthii tubus 6–12 lin. longus; segmenta linearia, 12–15 lin. longa. Antheræ 6–8 lin. longæ. *C. B. Spei in ditione Somerset,* Mrs. Barber!

2. C. veratrifolia, *Baker.*—Hypoxis plicata, *Jacq. Coll. Suppl.* 55; *Ic.* t. 367, *non Linn.*—H. veratrifolia, *Willd. Sp. Plant.* ii. 100; *Roem. et Schultes, Syst. Veg.* vii. 770.—Curculigo plicata *β*, *Ker in Bot. Reg.* t. 345. Cormus annuus globosus 9–12 lin. crassus, tunicis fibrosis cancellatis vestitus. Folia exteriora haud producta brunnea lanceolata. Folia producta 3–4 lanceolata 6–9 poll. longa medio 1–1½ poll. lata sessilia acuta glabra plicata, margine ciliata. Flores 2–4ni, pedicellis ex vaginis basalibus protrusis, ovario cylindrico 6–9 lin. longo, tubo piloso viridulo 1–2 poll. longo, limbi segmentis lanceolatis acutis 9–12 lin. longis, exterioribus dorso viridulis. Antheræ lineares 4 lin. longæ. Stigmata linearia discreta. *C. B. Spei,* Zeyher 1664! Vix ultra varietatem latifoliam *C. plicatæ,* tubo breviore.

3. C. gallabatensis, *Schweinf. Pl. Gallab. Exsic.* no. 39; *Baker in Trans. Linn. Soc.* ser. ii. *Bot.* i. 266. Tuber oblongum lignosum 1½–2 poll. longum reliquiis multis foliorum delapsorum coronatum. Folia producta 3–4 linearia acuta subpedalia plicata glabra, medio 6–9 lin. lata, ad petiolum brevem basi dilatatum pilosum sensim angustata. Flores solitarii radicales sessiles, bracteis membranaceis linearibus vel lanceolatis 12–18 lin. longis, ovario clavato piloso, tubo filiformi piloso 1½–2 poll. longo, limbi segmentis 4–6 lin. longis luteis, exterioribus dorso pilosis. Genitalia limbo paulo breviora, antheris lanceolatis. Stylus subulatus; stigma capitatum. "Semina plura aterrima dura strophiolis carnosis albidis pulposis distinctis, umbilico rostelliformi" *(Welw.) Gallabat ad ripas fluminis Gendua,* Schweinfurth! *Angola in ditione Golungo Alto,* Welwitsch!

Var. major, *Baker.*—Gethyllis pilosa, *Schum. & Thonn. Fl. Guin.* 172. Elatior, foliis sesquipedalibus vel bipedalibus, petiolis et vaginis haud productis magis villosis, floribus majoribus, tubo 3–4 poll. longo, limbi segmentis lanceolatis 9–12 lin. longis. *Nupe in arenosis graminosis,* Barter 1506!

4. C. SCORZONERÆFOLIA, *Benth. Fl. Austral.* vi. 449.—Hypoxis scorzoneræfolia, *Lam. Encyc.* iii. 183; *Roem. et Schultes, Syst. Veg.* vii. 763; *Seubert in Mart. Fl. Bras.* iii. 50; *Desc. Fl. Antill.* viii. 351, t. 593; *Griseb. Flor. Brit. West Ind.* 585. Tuber perenne oblongo-cylindricum 1–2 poll. longum, reliquiis fibrosis foliorum delapsorum coronatum, fibris radicalibus carnosis cylindricis. Folia producta 2–6 linearia vel lanceolata subpetiolata 9–12 poll. longa medio 1½–12 lin. lata plicata pilosa a medio utrinque sensim angustata. Pedunculi uniflori brevissimi ex vaginis basalibus haud protrusi, bracteis lanceolatis membranaceis, ovario oblongo, perianthii tubo filiformi 1–2-pollicari dense villoso, limbi segmentis luteis lanceolatis 6–9 lin. longis, exterioribus dorso rubellis villosis. Stamina limbo triplo breviora, antheris 1–1½ lin. longis lanceolatis basi sagittatis. Stylus filiformis; stigmata parva concreta. Capsula indehiscens oblonga bracteis persistentibus occulta, seminibus lucidis oblongis 1 lin. longis. *America tropicalis; Cuba ad Brasiliam et Peruviam,* Wright 3249! Gardner 1859! 2008! Spruce 1294! 3662! 4506! Burchell 6433! 8120! C. Wright 3249! Schomburgk 652! &c.

5. C. ORCHIOIDES, *Gærtn. Sem.* i. 63, t. 16; *Roxb. Corom.* i. 14, t. 13; *Dryand. in Ait. Hort. Kew.* edit. 2, ii. 253; *Roem. et Schultes, Syst. Veg.* vii. 756; *Wall. Cat.* 5158.—C. malabarica, *Wight, Ic.* t. 2043, fig. dextr.—Hypoxis orchioides, *Kurz in Ann. Mus. Lug.-Bat.* iv. 177.—Orchis amboinica major radice raphanoidea, *Rumph. Amboin.* vii. 117, tab. 54. fig. 1. Tuber oblongum setis densis coronatum, fibris radicalibus carnosis cylindricis. Folia producta 3–6 petiolata lanceolata 6–12 poll. longa medio 3–12 lin. lata membranacea glabra plicata. Petioli 3–6 poll. longi basi dilatati. Racemi congesti basilares, bracteis membranaceis lanceolatis 9–18 lin. longis, ovario oblongo subsessili, tubo filiformi piloso 1–3 poll. longo, limbi lutei segmentis lanceolatis 6–9 lin. longis. Stamina limbo duplo breviora, antheris lanceolatis 1½–2 lin. longis, basi sagittatis, filamento filiformi longioribus. Stylus brevis; stigmata discreta. Capsula oblonga occulta indehiscens. *Japonia, India orientalis, insulæ Loo-choo, Hong-Kong, Java, Australia borealis, Nova Caledonia.*—C. BREVIFOLIA, *Dryand. in Ait. Hort. Kew.* edit. 2, ii. 253; *Wt. Ic.* t. 2043; C. orchioides, *Bot. Mag.* t. 1076; Hypoxis dulcis, *Steud. in Hohenack. Pl. Canar.* no. 135, est forma foliis lanceolatis 3–4 poll. longis. C. FIRMA, *Kotschy et Peyr. Pl. Tinn.* 45, tab. 22 B, est forma nubica foliis linearibus pilosis 2–5 poll. longis; et C. ENSIFOLIA, *R. Br. Prodr. Fl. Nov. Holl.* 290; C. stans, *Labill. Sert. Austr. Caled.* i. 18, t. 24, forma foliis elongatis linearibus, floribus minoribus.

6. C. SEYCHELLENSIS, *Bojer, Hort. Maur.* 348 (*nomen solum*); *Baker, Flora Maur.* 368. Tuber magnum perenne. Petioli validi pedales vel sesquipedales calvati aculeis copiosis patulis 1½–2 lin. longis

armati, inferne dilatato-alati. Lamina 2–3-pedalis et ultra profunde bifida glabra subcoriacea plicata, costa aculeata. Flores 30–40 et ultra in capitulum sessile erectum densissimum dispositi basi villosissimum, bracteis lanceolatis pilosis membranaceis 2–4 poll. longis. Ovarium subsessile vel breviter pedicellatum oblongum villosum. Perianthii tubus cylindricus 2–3-pollicaris plus minusve villosus; limbus 6–8 lin. longus luteus siccitate nigrescens, segmentis exterioribus dorso nudis. Antheræ lanceolatæ 2–3 lin. longæ, filamentis brevibus crassis. Stylus cylindricus; stigmata concreta. *Insulæ Seychellenses, frequens in sylvis,* Bojer! Blackburn! Horne 241! Icon. Newman! "*Coco marron*" incolarum. "Folia 1–7 pedes longa, 4 poll. ad 4 pedes lata," *Horne.*

7. C. LATIFOLIA, *Dryand. in Ait. Hort. Kew.* edit. 2, vol. ii. 253; *Bot. Mag.* t. 2034; *Bot. Reg.* t. 754; *Roem. et Schultes, Syst. Veg.* vii. 757.—C. sumatrana, *Roxb. Fl. Ind.* ii. 146; *Lodd. Bot. Cab.* t. 443; *Roem. et Schultes, Syst. Veg.* vii. 758 (*excl. syn. Collæ*); *Wight Ic.* t. 2042.—Molineria sumatrana, *Herb. Amaryll.* 84.—M. latifolia *et* plicata, *Kurz in Ann. Mus. Lug.-Bat.* iv. 176. Tuber subnullum, fibris radicalibus pluribus elongatis. Petioli semipedales vel pedales basi dilatati. Folia lanceolata vel oblongo-lanceolata 1–2-pedalia medio 2–4 poll. lata membranacea plicata utrinque viridia glabra vel dorso obscure pilosa. Pedunculus brevissimus vel subnullus villosus, floribus in capitulum globosum vel oblongum aggregatis, bracteis membranaceis lanceolatis 6–18 lin. longis utrinque glabris, pedicellis nullis. Ovarium sessile oblongum vel globosum villosum 3 lin. longum. Perianthii tubus cylindricus semipollicaris villosus; limbus 4–6 lin. longus, segmentis oblongis vel lanceolatis dorso pilosis. Stamina limbo duplo breviora, filamentis brevissimis. Stylus filiformis leviter declinatus; stigmata minuta concreta. Bacca oblonga semipollicaris, seminibus atris lucidis 1 lin. longis. *Birma et Malaya,* Griffith 5932! Helfer 5933! 5940! Maingay! *Java,* Zollinger 477! *Sumatra,* Roxburgh. *Borneo,* Motley 756!

Var. C. VILLOSA, *Wall. Cat.* 5163, A.—Molineria villosa, *Kurz, loc. cit.* Folia subtus ubique pilis patentibus brevibus mollibus albidis pilosa. *Singapore,* Wallich 5163 A! Kurz. *Burma,* Helfer 5933! *Borneo,* Motley 937!

4. PAURIDIA, *Harvey.*

Harvey, Cape Gen. edit. i. 341, edit. ii. 385; *Endl. Gen.* 1360.—Ixiæ sp., *Linn. fil. &c.*—Galaxiæ sp., *Ker.*—Romuleæ sp., *Ecklon.*

Perianthii tubus supra ovarium productus brevis infundibularis; segmenta 6 oblanceolata subæqualia alba exteriora dorso glabra.

Stamina 3 segmentis interioribus opposita in tubum perianthii inserta, filamentis brevibus filiformibus, antheris lanceolatis basifixis basi sagittatis. *Ovarium* inferum triloculare ovulis in loculo pluribus; stylus subulatus, profunde 6-fidus, ramis 3 elongatis, 3 brevissimis. *Capsula* oblonga glabra indehiscens, seminibus multis minutis globosis.

1. P. HYPOXIDOIDES, *Harv. loc. cit.*—Ixia minuta, *Linn. fil. Suppl.* 92; *Thunb. Diss. Ixia*, no. 2, tab. 1. fig. 1; *Prodr.* 9; *Fl. Cap.* i. 216.—Galaxia minuta, *Ker in König & Sims Ann.* i. 241; *Gen. Irid.* 71.—Romulea minuta, *Eckl. Verz. Topog.* 19.—Hypoxis triandra, *Pappe, MSS.*—H. nana, *E. Meyer in Herb. Drège.* Cormus annuus globosus 2–3 lin. crassus collo elongato, setis copiosis coronatus. Folia producta 6–12 glabra linearia graminoidea acuminata multifaria 1–2 poll. longa. Pedunculi 3–6ni 1–2 poll. longi gracillimi glabri uniflori, bracteis minutis setaceis. Ovarium glabrum clavatum 1 lin. longum. Perianthium album 3–4 lin. longum, tubo infundibulari segmentis 2–3plo breviore. Genitalia ex tubo protrusa. Capsula $1\frac{1}{2}$–2 lin. longa. *C. B. Spei*, Thunberg! Burchell 8448! Pappe! Drège! &c.

Plants to be altogether excluded from Hypoxidaceæ.

HYPOXIDOPSIS PUMILA, *Steud. in Hohenack. Pl. Canar.* no. 1313, = Iphigenia indica, *Kunth.*

HYPOXIS SCHNITZLEINIA, *Hochst. in Regensb. Flora*, 1844, p. 31, is a species of *Xerophyta.*

HYPOXIS FASCICULARIS, *Linn.* (Monocaryum fasciculare, *R. & S.*) is a form of *Colchicum montanum.*

HYPOXIS RAMOSA, *Lodd. Bot. Cab.* t. 1936, belongs to Iridaceæ, and is probably a *Romulea.*

H. SPICATA, *Thunb.*, = Aletris japonica.

On some Genera of the Olacaceæ. By JOHN MIERS, F.R.S., F.L.S., &c., Dignit. et Commend. Ord. Bras. Imp. Rosæ.

[Read March 21, 1878.]

(PLATES V.–VII.)

Myoschilos, *Arjona*, and *Quinchamalium* are referred by the authors of the 'Genera Plantarum' to Santalaceæ *, whereas I had previously placed them in Olacaceæ †. I now propose to

* Benth. & Hook. Gen. Plant. i. p. 345.

† In Lindl. Veg. Kingd. p. 444 *a*.

justify this conclusion by evidence founded on my own observations upon the living plants, made many years ago. These closely allied genera may be united into a distinct tribe (Arjoneæ), the distinguishing character of which is that each flower is supported upon a calycle, which, though sometimes small, is always distinguishable.

MYOSCHILOS.

This genus of the 'Flora Peruviana,' little known and less understood, was established in 1794 by Ruiz and Pavon, under some misconception; for at first * they described its fruit as crowned by the persistent perianth, a mistake repeated by every succeeding botanist; afterwards they corrected this error, delineating it as surmounted by a ring of 5 acute teeth †. I have still the original analysis of the fruit, made 57 years ago; and many specimens of this fruit are still preserved. Upon good data, therefore, the following diagnosis of the genus is given.

MYOSCHILOS, *R. & P.* Char. emendatus.

Calyculus imo hemisphæricus, latere externo in lamellam acuminatam productus. *Calyx* ei insitus, bisepalus, parvus, cum calyculo immutatus et persistens. *Corolla* tubulosa, carnosula, purpurea; *tubus* campanulato-cylindricus, imo ad ovarium arcte adglutinatus, supra medium 4–5-partitus; *segmenta* acute oblonga, carnosula, patentim reflexa, æstivatione valvata, paullo sub apicem ungue mucroniformi extus munita, serius decidua. *Stamina* 4–5, segmentis opposita æquilonga; *filamenta* subulata, erecta, e margine disci orta, glabra; *antheræ* ovatæ, 2-loculares, sine connectivo, antice dehiscentes. *Discus* epigynus, carnosus, conice convexus. *Stylus* subulatus. *Stigmata* 3, minuta, divaricata. *Ovarium* obovatum, basi corollæ vestitum, disco coronatum, 1-loculare. *Ovula* 3, apice placentæ liberæ filiformis suspensa. *Drupa* baccata, ovata, apice styli vestigio et linea circulari (e margine disci) notata; *nux* conformis, testacea, 1-locularis, monosperma; *semen* loculum implens, e placenta nunc laterali cum ovulis abortivis suspensum; *integumenta* nulla; *albumen* carnosum album; *embryo* axilis, hoc brevior; *radicula* teres, supera; *cotyledones* 2, parvæ, compresse orbiculares multoties breviores.

Arbuscula *subhumilis Chilensis, valde ramosa*; rami *subvirgati, subbreves, iterum iterumque ramulosi, glabri*; folia *tarde devoluta, parvula, oblongo-ovata*; flores *spicati, præcociter ante folia evoluti, minimi, amentiformi-imbricati.*

* Prodromus, p. 41, and tab. 34. § 3. fig. 7.

† Fl. Per. iii. p. 20, tab. 242 *a*. fig. 5.

Myoschilos oblonga, *R. & P. Prodr.* p. 41, tab. 34; *Flor. Peruv.* iii. p. 20, tab. 242 *a*; *Lam. Dict. Suppl.* iv. p. 43.—Myoschilos oblongum, *Gay, Chile,* v. p. 327.—Myoschilos oblongus, *A. DC. Prodr.* xiv. p. 627. Chile in humidis: *v. v. et sicc. in herb. meo* ex Chile (nn. 259, 21,090) in flore et fructu, in flore (*Cuming* 738); Cordill. Chillan (19,557), in flore et fructu (*Germain*); Chiloë et Valdivia (7920), in flore (*Capt. King*).

I found this plant in 1820, when I made a coloured drawing of it, with copious analytical details. It grew upon the margin of the small river of Reñaca, about 12 miles to the north of Valparaiso. It is a small tree, about 6 feet high, slenderly much branched, bearing numerous flowers long prior to the appearance of most of the leaves. The leaves are alternate, about 1–3 lines apart, of a dull green colour, obovate, acute, mucronulate, with subrevolute margins, without apparent nerves, 4–8 lines long, 2–4 lines broad, on slender channelled petioles $\frac{1}{2}$ line long, very slightly puberulous on both sides; many lateral spikes at the ends of the still leafless young branchlets, alternate, 3–6 lines apart: peduncle 6–9 lines long, densely covered all over with numerous approximate flowers, rarely 1 line apart; calycle cupuliform, $\frac{3}{4}$ line long, $\frac{1}{2}$ line broad, with a frontal lateral erect acute extension 1 line long, pilose on both sides; sepals 2, seated within the calycle alternately with its expansion, linear, acuminate, pubescent all over, $\frac{3}{4}$ line long, $\frac{1}{2}$ line broad; corolla of a bright red colour, tube 1 line long, shortly adnate at its base to the ovary, limb 5- (rarely 4-) partite; segments acutely oblong, fleshy, subreflexed, $\frac{3}{4}$ line long, each furnished below the apex outside with a short hooked spur: stamens equal in number to the segments, opposite to them, included; filaments compressed, subulate, arising from the margin of the disk and partly adherent to the tube; anthers emitting a minute bright yellow pollen, and bursting longitudinally: style and stigma as long as the stamens: drupe of a dark purple colour, oval, 3 lines long, $2\frac{1}{2}$ lines broad, supported by the persistent calycle and sepals: rest as in the generic character.

I cannot detect any tangible specific difference between the specimens above quoted and obtained from such distant localities.

Arjona.

This genus was established by Cavanilles in 1797. It consists of 8 species, all herbaceous plants, with several suberect stems

growing out of a napiform root often bearing edible oblong tubers. The stems are charged with alternate lanceolate leaves; and the inflorescence is terminal on a simple peduncle, bearing several alternately approximate flowers.

Arjona, *Cav.* Char. emendatus.

Flores hermaphroditi. *Calyculus* brevissime stipitatus, imo cupulatus, margine exteriore in lamellam lanceolatam erectam productus, utrinque pilosulus. *Calyx* isti insitus, paulo brevior, 2-sepalus; *sepala* distincta, lineari-acuminata, subfalcata, lateraliter opposita, suberecta, utrinque pilosa. *Corolla* longe tubulosa; *tubus* tenuis, incurvus, ad nervos 5 angulatus, imo ad ovarium breviter connatus, faucem versus ampliatus, intus sub segmenta *lituris* totidem linearibus niveis squamulis minutis crebre pennatis instructis; *segmenta* 5, acute triangularia, recurvatim expansa, intus glabra. *Stamina* 5, fauce inclusa, segmentis opposita; *filamenta* tenuissima, antheris dimidio breviora; *antheræ* 2-lobæ, ad medium dorsi affixæ, lobis sublinearibus, sine connectivo, lateraliter adnatis, antice dehiscentibus, fuliginosis; *pollen* minutum, flavum. *Discus* epigynus, subconvexus, *glandulis* 5 radiatim prominentibus persistentibus coronatus. *Stylus* filiformis, longissimus, stamina attingens; *stigmata* 3, parva, acuta. *Ovarium** pyriforme, subpentagonum, viride, ad basin tubi corollæ adglutinatum, supra 1-loculare, infra pro majore parte 3-loculare dissepimentis tenuissimis e placenta filiformi centrali productis; *ovula* 3, apice placentæ suspensa, uno in quoque loculo. *Fructus* ovatus, subparvus, glandulis 5 persistentibus coronatus; *pericarpium* fuscum, tenue; *nux* conformis, lutea, coriacea, abortu 1-locularis et monosperma; *semen* suspensum, nucem implens; *integumenta* nulla; *albumen* album, carnosum, pressione placentæ latere sulcatum; *embryo* centralis; *radicula* supera, teres; *cotyledones* 2, multoties breviores.

Herbæ *vel* fruticuli *humiles Americæ meridionalis*; radix *fusiformis, fibrillis sæpe tuberiferis munita*; caules *plurimi, suberecti, sæpe subramosi*; folia *alterna, rarius ternatim congesta, linearia, erecto-divergentia.* Flores *in capitulum terminale spicato-aggregati.*

1. Arjona tuberosa, *Cav.* (*non alior.*) *Icon.* iv. pp. 57, 58, tab. 383; *Lam. Dict. Suppl.* i. 451, tab. 921; *A. DC. Prodr.* xiv. 627 (excl. synon.).—Quinchamala patagonica, *Spr. Syst.* i. 537. Fretum Magalhãen, ad portum Deseado (*Née*): *non vidi.*

The typical plant upon which Cavanilles founded this genus was collected by Louis Née in 1789, in his voyage round the world

* In *A. rigida* mihi visum et ex vivo pictum; in *A. tuberosa*, Cav., ut videtur subsimile: in reliquis speciebus 6 adhuc incognitum, sed analogice forsan cum structura identica.

with Malespina. Née preserved a specimen, and made a coloured drawing of it while in a living state; from these ample materials Cavanilles drew his illustration and his excellent description. It is a small fruticose plant about 8 in. high, with a fusiform root 3 in. long, whose slender fibrils bear oblong tubers 10 lines long; the root at its summit throws out many erect simple or branching stems, about 6 in. high, striated and furnished with numerous approximated linear-lanceolate leaves, channelled and somewhat amplexicaul at the base, pungently cuspidate at the apex, somewhat recurvingly divergent, lower ones smaller, 6 lines long, upper ones 9 lines long, 1½ line broad, tomentous: inflorescence terminal, spicately corymbose, bearing numerous subapproximate sessile flowers; calycle of each flower linear-lanceolate, subvaginant, sharply cuspidate, 4½ lines long, 1½ line broad; sepals 2, laterally placed, opposite, concave, oblong, acutely tridentate at the summit, the middle tooth longest, glabrous, embracing the base of the corolla: corolla yellow, tomentose outside; tube cylindrical, 6 lines long, slender; segments ovate-oblong, subacute, with a terminal short bristle, 3 lines long: stamens almost sessile within the mouth of the tube; anthers linear-oblong, yellow: ovary very small, green, crowned by the yellow 5-lobed epigynous disk; style filamentous, red, reaching the stamens; stigmata 2 or 3, lamellar; pericarp globular, crowned by the persistent disk, 1 line in diameter.

No mention is made of any hair or scales in the mouth of the tube. Née's specimen, I believe, is preserved in the herbarium of the Academy of Madrid.

2. Arjona patagonica, *Hombr. et Jacq. Voy. Astrolabe,* tab. 15 a, *sine descr.*; *Hook. Fl. Ant.* ii. 342; *Gay, Chile,* v. 324.—Arjona tuberosa, var. patagonica, *A. DC. Prodr.* xiv. 627. Ad fretum Magalhãen portu Peckett: *non vidi.*

This species was collected by Hombron and Jacquinot in 1826: the New-Zealand portion of the plants obtained during the voyage was described by Richard in 1832; the other Phanerogamic plants were not described, but the illustrations of several of them were given by Dr. Hombron in the Atlas of plates accompanying the octavo volume of Richard. Dr. Hooker (*l.c.*) first described this species, in a short diagnosis, from Hombron's drawing; De Candolle, in 1856, enlarged this description from a plant of Lechler's.

It much resembles the typical species in size and habit, but is

everywhere glabrous; it has a similar root, but with smaller tubers; stems branching, erect, bare at the base; at first the lower leaves are only 1 line long, increasing upwards to a length of 4 lines, are shortly subulate, spreading, cuspidate at the apex, rigid, 5-nerved; the inflorescence is capitate, sericeo-tomentose; calycle concave, acute, half the length of the tube of the corolla.

3. Arjona pusilla, *Hook. Fl. Ant.* ii. 342; *A. DC. Prodr.* xiv. 627; *Gay, Chile,* v. 323. Fretum Magellanicum, ad port. Cape Gregory: *v. s. in herb. meo,* Cape Gregory (*Capt. King*).

A low-growing, suffruticose species, with few branching erect stems 3 in. high, bare at the base, very glabrous; lower leaves barely 1 line long, increasing upwards to a length of 6 lines, and ½ line broad, linear, subfalcate, channelled, 3-nerved; inflorescence terminal, flowers few, approximate: corolla yellow, subpuberulous outside; tube extremely slender, 5 lines long; segments acute, 2 lines long, ¾ line broad, subreflexed, glabrous: stamens included within the mouth.

4. Arjona appressa, *Philippi, Linn.* 33, p. 233. In Patagonia occidentali, Andibus de Rauco: *non vidi.*

Planta dense arachnoideo-lanata; radicellis filiformibus, tuberibus edulibus oblongis, 10 lin. longis et 5 lin. crassis præditis; caule elongato; ramis 4–5 poll. altis; foliis lanceolatis, 3-nerviis, inferioribus remotis, subreflexis, superioribus adpressis, fere imbricatis, 4 lin. long. ½ lin. lat.; flores non adsunt.

A species evidently near *A. tuberosa,* differing in its smaller stature, covered with dense arachnoid tomentum, and in its smaller, imbricated adpressed leaves.

5. Arjona ruscifolia, *Pöpp. secund. Meyer, Nov. Acta.* xix. *Suppl.* p. 412; *A. DC. Prodr.* xiv. p. 626.—Arjona andina, *Phil. Linn.* xxxiii. p. 232.—Arjona tuberosa, *Gay* (*non Cav.*) *Chile,* v. p. 322. In Chile prov. austro-centralibus: *v. s. in herb. meo,* 20,280, Cordillera de Maule (*Germain*); 20,662, Chile centr. (*Bridges* 557).

Root slender, fusiform, 8 in. long, with fibrous radicels bearing edible small tubers; stems many, erect, simple or branched, 3–7 in. high; leaves glabrous, subimbricate, lanceolate, patently recurved, channelled, subamplexicaul at the base, pungently cuspidate at the apex, rigid, lower ones 5-nerved, 4 lines long, upper ones with 7 prominent nerves, 5–6 lines long: terminal corymb subcapitate, 1 in. in diameter; peduncle 6 lines long, yellow,

striolate, glabrous, bearing numerous aggregated sessile flowers; calycle ovate-lanceolate, cuspidate, villous outside, $3\frac{1}{2}$–5 lines long, 1 line broad; sepals 2, erect, $1\frac{3}{4}$ line long, $\frac{1}{2}$ line broad, arachneo-tomentose: corolla of a yellowish red colour, sparsely invested with very long flexuose white hairs; tube slightly cylindrical, subincurved, $6\frac{1}{2}$ lines long; segments subacute, $2\frac{1}{2}$ lines long, $\frac{3}{4}$ line broad, subreflexed, glabrous within, except where they are each furnished at its base with a linear feather-like process densely pinnate, with shortish septiferous hairs; filaments slender, glabrous, reaching the mouth: anthers linear, 1 line long, verticillately attached dorsally in their middle, erect, half exserted; ovary oblong, $\frac{1}{2}$ line in diameter, surmounted by the usual disk and a very slender style reaching the stamens; stigmata 3, linear, lamellar, shortly hirsute.

6. Arjona rigida, *nob.*—Arjona tuberosa, *Philippi* (*non Cav.*), *Linn.* xxxiii. p. 231.

Humilis, suffruticosa, caulibus gracilibus, striatis, glabris; foliis inferioribus minoribus, sparsis, superioribus majoribus, magis approximatis, lineari-lanceolatis, canaliculatis, imo amplexicaulibus, apice pungenti-cuspidatis, rigidis, conspicue 5-nerviis, marginibus cartilagineis, patentim divaricatis, subrecurvulis, glabris, supra pallide viridibus, subtus flavide opacis, nervis prominentibus; inflorescentia terminali, laxe capitata; pedunculo brevi, sericeo-piloso; floribus sessilibus, subapproximatis; calyculo ovato-lanceolato, naviculari, acuminato, villoso; sepalis distincte 2, lateraliter oppositis, calyculo absconditis, acute oblongis, niveo-tomentosis; corolla aurantiaca, extus cano-villosa pilis retrorsis; tubo exigue cylindrico, striolato, fauce paullo ampliore; segmentis acute oblongis, subrevolutis, intus glabris, nisi ad lituris niveo-linearibus (ut in *A. ruscifolio*); staminibus fauce subinclusis; filamentis brevibus, tenuissimis; antheris linearibus, medio dorsi affixis; ovario breviter obconico, pentangulari, disco plano coronato; stylo filiformi, stamina attingente; stigmatibus 3, lamellatis, erecto-divergentibus. E regione Argentino, travesia del Desaguadero, inter provinc. Mendoza et San Luiz: *v. v. et sicc. in herb. meo* (410), cum icone ex vivo colorato; in travesia Mendozæ (1064).

Stems 3 in. high; lower leaves 2 in. long; upper ones $1\frac{1}{2}$ line apart, 6–8 lines long, $1\frac{1}{4}$ line broad; peduncles 4 lines long; laxly congested head of flowers 1 in. long, $\frac{3}{4}$ in. broad; calycle 4 lines long, $1\frac{1}{4}$ line broad; sepals 2 lines long, 1 line broad; tube of corolla 6 lines long; segments 2 lines long, $\frac{3}{4}$ line broad, each with a basal tomentous process 1 line long; linear anthers $1\frac{1}{4}$ line long.

7. Arjona longifolia, *Philippi, Ann. Univ. Chile* (1862), *Linn.* xxxiii. p. 232. Circa Mendosa (San Rafaël, *W. Diaz*): *v. v. et sicc. in herb. meo* (573, *cum icone ex vivo colorata*), circa Mendoza; *ex eod. loc.* (*Gillies*).

A suffruticose plant, with several alternate suberect branches 7 in. long, angularly striate, yellowish, glabrous, with axils ½–1 in. apart; leaves much elongated, linear-lanceolate, narrowed at the base, very acuminate and mucronate at the apex, divaricately patent, prominently 3–5-nerved, chartaceous (but not rigid), margins scabridly ciliate, sides folded together along the midrib, obsoletely pilose above, scabridulous beneath, 10–18 lines long, 1½ line broad: inflorescence terminal, at first capitate, afterwards more laxly flowered and supported upon a yellow peduncle, deeply sulcate, bare at its base for a length of 1¾–2 inches, head of flowers 1½ in. long; flowers yellow, subapproximate; calycle acutely oblong, channelled, densely cano-villose, 3 lines long, 1½ line broad; sepals 2, laterally opposite, acutely oblong, densely cano-pubescent, smooth inside, 2 lines long: corolla yellow, very tomentous externally; tube slender, narrowly cylindrical, subincurved, a little wider in the mouth, 6 lines long; segments subacute, tomentous outside, glabrous within except at the niveous streaks at their base, 3 lines long, ¾ line broad, subreflexed: stamens included in the mouth; anthers linear, fuscous, emitting a yellow pollen; ovary small, crowned by a flat disk marked by 5 reddish spots; style capillary, reaching the stamens; stigmata 3, lamellar, erecto-divergent.

8. Arjona linearis, *nob.*

Suffruticosa, ramosa; ramis suberectis, tenuibus, striolatis, fistulosis, flavescentibus, glabris; axillis remotiusculis; foliis anguste linearibus, ensiformibus, subrigidis, imo breviter amplexicaulibus, apice tenuiter pungentibus, trinerviis, marginibus cartilagineis, adpresse plicatis, utrinque vix pilosulis; inflorescentia terminali; pedunculo ad basin longe palato, sericeo-pubescente, superne multifloro; floribus superioribus capitato-congestis, inferioribus laxioribus. In jugo montium (Paramillo dictu) versus Mendoza: *v. v. et sicco in herbario meo* (no. 574), Villa Vicencio, altit. 5380 ped.

A species near the preceding, collected by me in 1826, when I made a coloured drawing of it. It differs in its narrower leaves, more lax inflorescence, with very sericeous flowers; its branches are 7–10 in. long, with axils 4–6 lines apart; leaves 12–21 lines long, 1–1¼ line broad when flattened; terminal peduncle very

slender, bare for a length of $1\frac{1}{2}$ in., the floriferous portion being $\frac{3}{4}$–1 in. long; flowers many, alternate, crowded towards the summit, on short pilose pedicels; calycle ligulate, its external margin extended to a length of 3 lines, sericeous outside, glabrous within; 2 acute sepals, seated within the calycle, right and left, velvety sericeous outside, smooth inside, 2 lines long, $1\frac{1}{2}$ line broad, with the calycle persistent: corolla very sericeous outside, yellow; tube very narrow, somewhat funnel-shaped above, 6 lines long; segments acute, subreflexed, $2\frac{1}{2}$ lines long, $\frac{3}{4}$ line broad: rest as in the generic character: fruit oval, 2 lines long, $1\frac{1}{2}$ line broad, crowned by the 5 raised glands and the remains of the style; albumen ovate, filling the cell of the nut, with the usual embryo.

Quinchamalium.

This genus of the 'Flora Peruviana' differs from *Arjona* in the form of its calycle, in the shape of its calyx, and in its corolla with stamens wholly exserted, and in its fruit enclosed in the persistent calyx.

Quinchamalium, *Feuillé*.

Flores hermaphroditi. *Calyculus* depresse cupularis, margine lacerato. *Calyx* globosus, lævis, 4–5-costatus, costis in dentes totidem terminatis, quorum unus externus paullo longior, persistens. *Corolla* tubulosa; *tubus* tenuiter cylindricus, subincurvus, ad faucem ampliatus; *segmenta* 4–5, acute oblonga, subrecurva, extus sub apicem ungue mucroniformi singulatim munita, æstivatione valvata. *Stamina* 4–5, fauci inserta, segmentis opposita; *filamenta* compressa, antheris paullo longiora, glabra; *antheræ* oblongæ paullulo supra basin affixæ, erectæ, exsertæ, apice subacutæ, imo breviter cordatæ, 2-lobæ, lobis sine connectivo lateralibus, antice longitudinaliter dehiscentibus. *Discus* epigynus, subconvexus. *Stylus* filiformis, stamina attingens; *stigmata* 3, parva, terminalia. *Ovarium* ovato-globosum, ad corollæ basin agglutinatum, 1-loculare; *ovula* 3, ex apice placentæ centralis filiformis suspensa. *Fructus* ovatus; *pericarpio* fusco, tenui; *nux* lævis, tenuissime testacea, 1-locularis, 1-sperma. *Semen* conforme, loculum implens; *integumenta* nulla; *albumen* carnosum; *embryo* inclusus; *radicula* supera, teres; *cotyledones* 2, compressæ, orbiculares, multo breviores.

Herbæ, *sæpe fruticulosæ, Americæ australis*; radices *fusiformes, fibrillosæ*; caules *plures, suberecti*; folia *alterna, linearia vel lineari-lanceolata*; flores *parvi, numerosi, sæpius in capitulum terminale congesti.*

1. Quinchamalium linifolium, *Feuillé* (*non Meyer*), sub "Q. lini folio," *Hist. pl. médicinales*, p. 57, tab. 44, et in *Observ. Append.* (vol. iii.) tab. 44.—Quinchamalium chilense, *in parte* (*non Molina*), *Lam. Dict.* vi. p. 34. In Chile, primo ab auct. lectum in prov. Concepcion (lat. 37° 40′ S.): *v. s. in herb. meo* (19556), pl. lecta in prov. Contigua, Talca (*Germain*).

The plant of Germain quite corresponds with the description and drawing of Feuillé. It has a similar branching root 2 in. long, throwing out about 9 suberect simple or branching stems 3–4 in. high, as in Feuillé's drawing; leaves linear, narrow, mucronulate, patently divergent and curving, 2–3 lines apart, 4–8 lines long, ¼ line broad, glabrous; inflorescence terminal in a capitate head, about ½ inch broad, upon a peduncle bare at its base for a length of 4 lines; calycles closely approximated upon the 4 faces of the peduncle, depressed, concave, with lacerated margins; calyx globular, with 5 unequal small teeth; corolla yellow, glabrous; tube slender, cylindrical, of a greenish hue, 4½ lines long; segments acute, subreflexed, yellow outside, reddish within, 2 lines long, ½ line broad.

2. Quinchamalium chilense, *Molina, Saggio* (1782), edit. Brit. (1809) i. p. 123 (*non A. DC.*); *Lam. Dict.* vi. 34, *in parte* (1804); *Willd. Syst.* ii. 1217 (1799); *Hook. Voy. Beechey*, p. 44, *in parte* (1841). In Chile centrali: *v. v. et sicco in herb. meo* (no. 227), Concon, prov. Valparaiso.

I found this plant in 1820, its vernacular name being *Quinchamali*. It is annual, with a stoutish, fistulose, herbaceous stem, about 5 in. high (sometimes, according to Molina, 9 in. in height), bare at its base for 1 inch, thence throwing up about 6 suberect alternate branches, again branched, all rising to the same level; leaves 4 lines apart, patently diverging and curving upwards, linear-lanceolate, acute at both ends, with subrevolute margins, glabrous, 1-nerved, with many transverse veins, 6–7 lines long, ½ line broad, on a short slender petiole; inflorescence terminal, with numerous sessile flowers aggregated in a subglobular head ¾ inch in diameter; calycles cupuliform, with a lacerated margin, persistent, crowded upon the 4 faces of the acutangular peduncle; calyx globular, often caducous, 1 line in diameter, 4-costate, each nerve terminating in a short acute tooth, the outer one a little longer; tube of corolla slender, 3 lines long, shortly adnate at its base to the ovary; segments 5, acutely triangular, 2½ lines long,

with valvate æstivation; stamens 5, altogether exserted, inserted in the mouth of the tube opposite the segments; filaments slender, as long as the anthers, which reach the top of the segments; anthers as in the gen. char.; style slender, 3-grooved; stigmata 3, roundish; ovary globular, 3-costate, crowned by the 5-glandular disk, 1-locular; ovules 3, suspended from the apex of a free central placenta; fruit globular, enclosed within the free calyx, its structure as in the generic character.

3. Quinchamalium procumbens, *R. & P. Flor. Peruv.* ii. p. 1, tab. 107 *b.*—Q. chilense, *Lam.* (*non Molina*) *Illustr.* ii. 135, tab. 142; *id. Dict. Suppl.* iv. p. 638, tab. 142; *A. DC. in parte, Prodr.* xiv. p. 625.—Quinchamalium Dombeyi, *Brongn. ex Hombron, Voy. Coq.* tab. 58, sine descript.; *A. DC. Prodr.* xiv. p. 626.—Quinchamalium linifolium, *Meyer* (*non Feuillé*), *Nov. Act.* xix. *Suppl.* p. 412. In Peruvia, prov. Tarma: *non vidi.*

As the details given by Brongniart and Meyer offer no characters at variance with those afforded by Ruiz and Pavon, all the above citations may be comprised under one species. Root fusiform, from which arise 7 or 8 stems, the 2 external ones procumbent, the others divergent or erect, 5 in. long, mostly simple, slender, glabrous, striate; leaves linear, sessile, acute at the apex, marked at the base by a purple spot, sparse, erecto-divergent, glabrous, 4–9 lines long, $\frac{1}{2}$ line broad; inflorescence terminal, bearing many spicately congested flowers in a dense head; calycles depressed, closely investing the faces of the quadrangular peduncle; calyx globular, with an oblique mouth, showing 4 small acute teeth, one of which is somewhat longer; corolla tubular, purplish red outside, yellow within, glabrous; tube cylindrical, pentangular, 9 lines long; segments 5, acutely oblong, 3 lines long, $\frac{3}{4}$ line broad, expanded; stamens inserted in the mouth, exserted; style slender, reaching the stamens; ovary small, globose, invested by the free calyx; pericarp globose, enclosed within the calyx, now somewhat enlarged.

4. Quinchamalium majus, *Brongn. ex Hombron, Voy. Coq.* tab. 51 A, sine descr.; *A. DC. l. c.* p. 625; *Gay, Chile,* v. 319.—Quinchamalium chilense, var. robustior, *Hook. Voy. Beechey*, p. 44.—Quinchamalium breviflorum, *Presl, Epim. Bot.* p. 246.—Quinchamalium rugosum, *Phil. Linn.* xxxiii. p. 233. In Chile, prov. Central: *v. v. et sicc. in herb. meo* (227*), Quintero, prov. Valparaiso.

Stems slender, 2–4, flexuose, 8–12 in. high, shortly branching towards the summit, glabrous, bare below the middle; leaves spreading, acutely linear, sessile, glabrous, 6–12 lines long, ¾ line broad, upper ones minutely ciliate on the margins; inflorescence terminal; flowers spicate, subapproximate; calycles depressed-cupular, attached to the 4 faces of the peduncle in close order; calyx small, globular, rugose at the base, 4-dentate, teeth ovate, minute, except the external one, which is much longer, suddenly acute, with a red margin; tube of corolla slender, widening in the mouth, 3½ lines long, glabrous, purplish; segments narrow, linear, acute, yellow, 2½ lines long, 3-nerved at the base; stamens exserted; anthers narrow, linear; fruit rugous according to Philippi. A species much resembling *Q. gracilis* in habit.

5. Quinchamalium gracile, *Brongn. ex Hombron, Voy. Coq.* tab. 52, sine descr. (1825); *Gay, Chile,* v. 320 (1849); *A. DC. Prodr.* xiv. p. 625 (1856).—Quinchamalium chilense, var. gracile, *Hook. Voy. Beechey,* p. 44 (1841).—Quinchamalium ericoides, *Brongn. l. c.* tab. 52; *Gay, Chile, l. c.* p. 320 (1849).—Quinchamalium minutum, *Phil. Ann. Univ. Chile* (1862); *Linn.* xxxiii. p. 233 (1864).—Quinchamala tenuis, *Steud. Nomencl.* ii. p. 429 (1841). In Chile, prov. austro-centr.: *v. s. in herb. meo,* (n. 7934) ins. Chiloë (*Capt. King*), (n. 6630) Concepcion (*Dr. Miller*), (n. 21039) Chile (*Cuming*).

A very slender, flexuous, fibrilliferous root, 3½ inches long, throwing up about 3 erect slender stems 2–3½ inches high; leaves very slender, linear, erecto-divergent, subfalcate, mucronate, glabrous, approximate, 4–9 lines long, ¼–½ line broad, on a very slender petiole ½–1 line long; inflorescence terminal, in a small capitate head, consisting of many small, orange-coloured, approximated flowers; corolla tubular, divided for half its length into 5 acute segments; stamens included, style subexserted; fruit small, globular, 5-costate, of a lemon-colour, enclosed within the free calyx, which has 5 unequal small teeth.

6. Quinchamalium elegans, *Presl, Epim. Bot.* p. 246 (1851); *Walp. Ann.* iii. 315.—Quinchamala tenuis, *Steud. Nom.* ii. p. 429, *ex plant. sub* Q. Chilense (*Bertero,* 581). In Chile, prov. Central.: *v. s. in herb. meo,* (20661) Chile (*Bridges,* 366), (21088) Chile (*Cuming*).

Stems several, slender, subdecumbent, curving upwards, ¾ line thick, striolated, glabrous, foliiferous from the base; axils 1–3 lines apart; leaves linear, almost filiform, with a pungent point, very

patent or deflected, 12–20 lines long, ½ line broad; inflorescence terminal, capitate, subglobular, ½ in. broad, upon a peduncle bare at its base for ¾–1 in.; flowers numerous, sessile, very approximated; calycle depressed; calyx small, globose, ¾ line broad, 4-costate, with unequal, short, acute teeth, one being a little larger; tube of corolla cylindrical, curved, 3 lines long; segments oblong, acute, 2 lines long, ½ line broad, yellow and glabrous inside, greenish outside, as well as the tube; stamens, style, and stigma exserted as far as the tips of the segments.

7. QUINCHAMALIUM FRUTICULOSUM, *Steud. Nom.* ii. p. 429; *A. DC. l. c.* p. 626 (*Bertero*, 1271), sine char.: *v. s. in herb. meo*, (19555) Chile, Cordillera de Chillan (*Germain*).

A suffruticose plant, with decumbent stem branching dichotomously or alternately; branches 5 in. high, slender, erect, subangular, finely striolated, glabrous; leaves 2 lines apart, younger ones closer and subimbricated, spathulately linear, sessile, obtuse at the base, mucronulate at the apex, curvingly patent, 1-nerved, with many thickish horizontal veins, 6–8 lines long, ½ line broad; inflorescence terminal in a subcapitate head; flowers approximated; calycles crowded on the spicate peduncle; calyx small, globular, 4-dentate, the external tooth narrow, as long as the calycine tube; tube of corolla slender, striolated, obsoletely pilose, 2½ lines long; segments acute, subreflexed, with the tube externally greenish, bright yellow and glabrous within, 1½ line long, ⅓ line broad; stamens inserted in the mouth; anthers half exserted.

These three genera were assigned to the *Santalaceæ* by Prof. A. DeCandolle in 1856 *, and about the same time also by the authors of the 'Genera Plantarum' †, because of the supposed presence of a perigonium, which signifies that the calyx and corolla are combined into one body. But it is shown by the preceding details that in each of these instances there exists a calyx, which, though small, is invariably present, always free and distinct from the corolla, and in each genus supported by a free calycle. Thus it is manifest that these three genera cannot belong to *Santalaceæ*, and there can be no doubt whatever that they agree in all respects with *Olacaceæ*, with the addition of a

* Prodr. xiv. pp. 624, 626, 627. † Gen. i. p. 345.

calycle in each flower, which places them in a distinct tribe of the family.

Prof. Baillon also places these genera in *Santalaceæ*, which, according to him, together with *Olacaceæ*, belong to a mere section of the *Loranthaceæ** : the validity of this view need not be here discussed, as his definitions are not consonant with the facts.

DESCRIPTION OF THE PLATES.

Plate V.

Fig. 1. Portion of a plant of *Myoschilos oblonga* : *natural size.*
2. The calycle : *natural size.*
3. The same, with the 2 free sepals seated within it, which embrace the base of the corolla ;
4. The corolla, seen from above : *both natural size.*
5. The calycle : *magnified.*
6. The 2 free sepals : *also enlarged.*
7. The corolla, seen sideways ;
8. The same, showing the basal portion of its tube agglutinated to the ovary, its free portion being cut open to expose the 5 segments, leaving one of the stamens *in situ* ;
9. The five stamens, seated on the margin of the disk, all opposite to the segments : *all magnified.*
10. One of the segments of the corolla, seen dorsally, to show the short mucroniform spur below the apex : *magnified.*
11. A longitudinal section of the ovary, style, and stigma, showing its solitary cell, from the bottom of which arises the free filamentous placenta, from the apex of which 3 small ovules are suspended : *magnified.*
12. The fruit, supported by the persistent calycle and sepals : *natural size.*
13. The same, with half of the pericarp removed to show the enclosed nut.
14. The solitary albuminous seed removed, having no integument, showing the persistent filiform placenta pushed on one side : *natural size.*
15. The same : *magnified.*
16. The persistent placenta, with the 2 abortive ovules : *magnified.*
17. A longitudinal section of the albuminous seed, with the enclosed embryo : *magnified.*
18. The embryo separated, with its superior radicle and 2 short cotyledons : *magnified.*

Plate VI.

Fig. 1. Drawing of a plant of *Arjona rigida* ;
2. The calycle, with its cupular base shown from the inside ;
3. A flower, supported by its 2 sepals : *all natural size.*
4. The calycle : *magnified.*

---

* Adansonia, iii. pp. 114, 115.

Fig. 5. The 2 sepals, removed from the calycle where they were seated;
6. The corolla, which with the sepals are seated on the concave base of the calycle;
7. The corolla, with its basal portion agglutinated to the ovary, the superior tubular portion cut open to show the hairy patches at the base of the segments: *all magnified.*
8. A stamen (enlarged), shown in three positions; the 5 stamens are inserted in the mouth of the tube, opposite to the hairy patches.
9. A tetrahedral grain of pollen: *exceedingly magnified.*
10. The ovary, style, and stigma: *slightly enlarged.*
11. The ovary, crowned by the persistent, conical, 5-lobed disk;
12. A longitudinal section of the same, showing it to be unilocular at the summit, trilocular below, with a central line up the middle, indicating the union of the three dissepiments, from the apex of which 3 minute ovules are suspended: *both magnified.*
13. The fruit: *natural size.*
14. The same, supported by the calycle and sepals, and surmounted by the persistent disk: *much magnified.*
15. A longitudinal section of the same, showing its solitary suspended seed, the placenta and 2 abortive ovules still remaining;
16. The solitary albuminous seed without any integument;
17. A longitudinal section of the same, with its included embryo;
18. The embryo extracted, showing the superior radicle and 2 much smaller cotyledons: *all magnified on the same scale.*

PLATE VII.

Fig. 1. A plant of *Quinchamalium chilense.*
2. A portion of the inflorescence: *natural size.*
3. Portion of the quadrangular peduncle, bearing on each of its 4 faces a row of persistent calycles, from which the flowers have fallen away;
4. A concave calycle: *both somewhat magnified.*
5. A flower seated in its calyx;
6. The flower removed: *both natural size.*
7. The 5-toothed globular calyx, one of the teeth longer than the others;
8. The base of the tube of the corolla adnate to the ovary, enclosed within the free calyx;
9. The corolla separated: *all magnified on the same scale.*
10. The upper free portion of the corolla cut open to show the 5 stamens placed opposite to its segments;
11. A stamen, shown in front and sideway: *slightly magnified.*
12. A transverse section across the segments of the corolla, to show the manner of æstivation: *enlarged.*
13. A portion of the style and stigma: *much magnified.*
14. The ovary, surmounted by the persistent disk;
15. A longitudinal section of the same, showing it to be unilocular, with a free central placenta rising from the base, bearing on its apex 3 suspended ovules: *both magnified.*
16. A fruit, enclosed within the persistent calyx;
17. The fruit extracted: *both natural size.*

Fig. 18. The same: *magnified.*
19. The crustaceous pericarp of the same, with the nucleus taken away;
20. The albuminous nucleus extracted, showing the persistent placenta;
21. A longitudinal section of the same, showing the included embryo;
22. The embryo extracted, shown in two positions: *all magnified on the same scale.*

The Fungi of Texas. By M. C. Cooke, A.L.S.

[Read April 4, 1878.]

(Abstract.)

The communication of which the following is an abstract contained an enumeration of a small collection of Fungi made by Mr. H. W. Ravenal in a trip to Texas some few years since. In addition to this, all previously recorded species for that State were collated, and the result was the determination of a total of 149 species as all which, up to the present, have been recorded. This number is exceedingly small, and only serves to prove how very little is known of the mycologic flora of a state which probably is as rich in fungi as South Carolina.

The following twenty-five species are all that are absolutely new.

Corticium carneum, *Berk. & Cooke.*—Effusum, membranaceum vel subceraceum, ochraceo-carneum, ambitu albo-fibrillosum; hymenio tenui, subglabro, lævi, siccitate rimoso.

On logs. Houston, Texas (*Rav.* 78).

The hymenium gives rise to fusiform rough cysts, such as are found in *Corticium cinereum*, which project above the surface, but do not occasion any velvety appearance, either to the naked eye or under a lens.

Cyphella convoluta, *Cooke.*—Sparsa; pileo cupuliformi (1–2 m. m.) demum applanato, margine membranaceo, involuto, extus albo, intus carneo-rubro; sporis oblongis (·007 m. m.).

On trunks. Houston (*Rav.* 295).

Phoma hysteriiforme, *Cooke.*—Gregaria; peritheciis atris, elongatis, hysteriiformibus, ad basin applanatis; sporis ellipticis, binucleatis, hyalinis (·01–·012 m. m.).

On herbaceous stems. Galveston (*Rav.* 224).

Phlyctæna smilacis, *Cooke.*—Tecta, minuta, brunnea, dense gregaria, pauce elevata; sporis filiformibus, elongatis, ad apicem curvulis (·02–·025 m. m.).

On *Smilax*. Houston (*Rav.* 208, 209).

HENDERSONIA MAGNA, *Cooke*.—Erumpens in lineas seriatas disposita; peritheciis atris, subglobosis, hinc illic connatis, dothidioideis, irregulariter fissuratis; sporis cylindraceis, obtusis, 3–5-septatis (·06–·065 × ·01 m. m.).

On herbaceous stems. Houston (*Rav*. 140).

DISCELLA LEGUMINUM, *Cooke*.—Congesta; pustulis irregularibus, maculam nigram efformantibus, demum confluentibus; sporis ellipticis vel pyriformibus, uninucleatis, hyalinis (·012–·015 m. m.).

On legumes of *Prosopis*. Galveston.

DISCELLA ANGULATA, *Cooke*.—Gregaria, tecta, epidermide in fissuris angulatis diffindens; sporis fusoideo-elongatis, hyalinis (·02 × ·004 m. m.).

On limbs of trees. Galveston (*Rav*. 58).

PHYLLOSTICTA MICROPUNCTA, *Cooke*.—Epiphylla; peritheciis minutis, atris, in maculis suborbicularibus congestis; sporis minutis, ovatis, hyalinis (·003 m. m. long.).

On leaves of *Persea carolinensis*. Houston (*Rav*. 235).

SEPTORIA MAGNOLIÆ, *Cooke*.—Epiphylla; peritheciis atris, subimmersis, in maculis irregularibus brunneis congestis; sporis linearibus, nucleatis (·025–·03 m. m. long.).

On leaves of *Magnolia grandiflora*. Houston (*Rav*. 8).

SPORIDESMIUM MUNDULUM, *Cooke*.—Effusum, album; sporis subovatis, cellulosis, atro-brunneis, subopacis, diu adhærentibus (·015 × ·01 m. m.).

On oak logs. Houston (*Rav*. 197).

MACROSPORIUM COMPACTUM, *Cooke*.—Atrum, in crusta compacta effusum; hyphis fasciculatis, brunneis, septatis, simplicibus; sporis ovalibus, obtusis, cellulosis, fuligineis (·02–·03 × ·012–·014 m. m.).

On stems of *Ricinus*. Houston (*Rav*. 272, 273).

CERCOSPORA GNAPHALIACEA, *Cooke*.—Amphigena; hyphis fasciculatis, simplicibus, in maculis suborbicularibus fuscis oriundis; sporis robustis, linearibus, 3–5-septatis, hyalinis (·04–·07 × ·005 m. m.).

On leaves of *Gnaphalium*. Houston (*Rav*. 283).

PATELLARIA CYANEA, *Cooke*.—Sparsa, atro-cyanea; cupulis applanatis, orbicularibus (½–1 m. m.) convexis; ascis clavatis, ses-

silibus; sporidiis clavatis vel fusoideis, 3–5-septatis, subconstrictis (·03 × ·007 m. m.) cellulis nucleatis; paraphysibus clavatis, simplicibus vel furcatis, sursum atro-cyaneis.

On herbaceous stems. Houston (*Rav.* 223).

Hysterium (Glonium) medium, *Cooke.*—Peritheciis ellipticis vel elongatis, utrinque obtusis, supra applanatis, atris, dense gregariis vel subconfluentibus; ascis cylindraceis; sporidiis ovalibus, demum uniseptatis, hyalinis (·008–·01 × ·004 m. m.).

On decorticated *Berchemia.* Houston (*Rav.* 293).

Diatrype (Diatrypella) opaca, *Cooke.*—Erumpens, suborbicularis, atro-brunnea; ostiolis depressis, sulcatis, vix distinctis; ascis clavatis, longe stipitatis; sporidiis leviter curvulis, numerosissimis, subluteolis.

On *Ilex opaca.* Houston (*Rav.* 243).

In some respects resembling *Diatrype quercina*, but smaller, neater, and in many other respects distinct.

Diatrype rumpens, *Cooke.*—Elliptica, tenuis; ostiolis vix prominulis, cuticula rupta cinctis; ascis cylindraceis; sporidiis late amygdalæformibus, atro-brunneis, opacis (·015 × ·009 m. m.).

On bark. Galveston Bay (*Rav.* 63).

Diatrype exutans, *Cooke.*—Late effusa, nigra, subcuticularis; ostiolis punctiformibus, depressis; ascis cylindraceis; sporidiis ellipticis, utrinque attenuatis, brunneis, uninucleatis (·015 × ·008 m. m.).

On bark. Galveston Bay (*Rav.* 76).

Sphæria (Immersæ) botulæspora, *Cooke.*—Gregaria, immersa; peritheciis atris, elongato-compressis, poro pertusis; ascis saccatis; sporidiis cylindraceis, rectis vel leviter curvulis, utrinque obtusis, uniseptatis, fuscis, cellulis inæqualibus (·07–·08 × ·012 m. m.).

On old oak rails. Houston (*Rav.* 202).

Sphæria (Immersæ) texensis, *Cooke.*—Sparsa, grisea; peritheciis subglobosis, in ligno nigro facto immersis, vix prominulis; ascis cylindraceis; sporidiis lanceolatis, uniseptatis, hyalinis (·015–·006 m. m.).

On oak rails. Houston (*Rav.* 250).

Sphæria (Obtectæ) pertacta, *Cooke.*—Subtecta, seriata; peritheciis globosis, atris, demum supra conspectis, poro pertusis;

ascis clavatis, sessilibus; sporidiis ellipticis, utrinque attenuatis, hyalinis (·02–·023 × ·01 m. m.).

On fallen branches. Galveston Bay (*Rav.* 57).

SPHÆRIA (CAULICOLÆ) TORULÆSPORA, *Cooke*.—Gregaria; perithecia atra, subconoidea, ad basin applanata, demum nuda; sporidiis linearibus, multiseptatis, brunneis, subconstrictis, toruloideis (·08 × ·004 m. m.).

On herbaceous stems. Houston (*Rav.* 60).

SPHÆRIA (CAULICOLÆ) UVÆSPORA, *Cooke*.—Gregaria, tecta; peritheciis subglobosis, parvulis, brunneis, poro pertusis; ascis clavatis; sporidiis breviter clavatis, simplicibus, hyalinis (·012–·015 × ·005 m. m.).

On flower-stalk of *Yucca*. Houston (*Rav.* 18).

Sporidia in form resembling grape seeds, but apparently immature; possibly they would ultimately become coloured.

SPHÆRELLA EXUTANS, *Cooke*.—Maculis minutis, atro-brunneis; peritheciis paucis, immersis, demum epidermide operculoideis exutantibus; ascis clavato-cylindraceis; sporidiis elongato-ellipticis, inæqualiter uniseptatis, hyalinis (·022 × ·004 m. m.).

On upper surface of leaves of *Persea*. Houston (*Rav.* 46).

The cuticle of the leaf is cast off in little opercular disks above the perithecia, somewhat in the manner of the operculum in *Stegia*.

DOTHIDEA ILICIS, *Cooke*.—Gregaria, erumpens; pustulis ellipticis, atris, cellulis stromate inclusis; ascis clavatis; sporidiis ellipticis, sæpe utrinque leviter attenuatis, simplicibus, hyalinis (·03 × ·01 m. m.).

On bark of *Ilex opaca*. Houston (*Rav.* 284).

STIGMATEA GREGARIA, *Cooke*.—Epiphylla; peritheciis gregariis, erumpentibus, atris, globosis, subnitidis; ascis cylindraceis; sporidiis subglobosis, hyalinis (·01–·012 × ·009 m. m.).

On unknown leaves. Meskat Bay (*Rav.* 306).

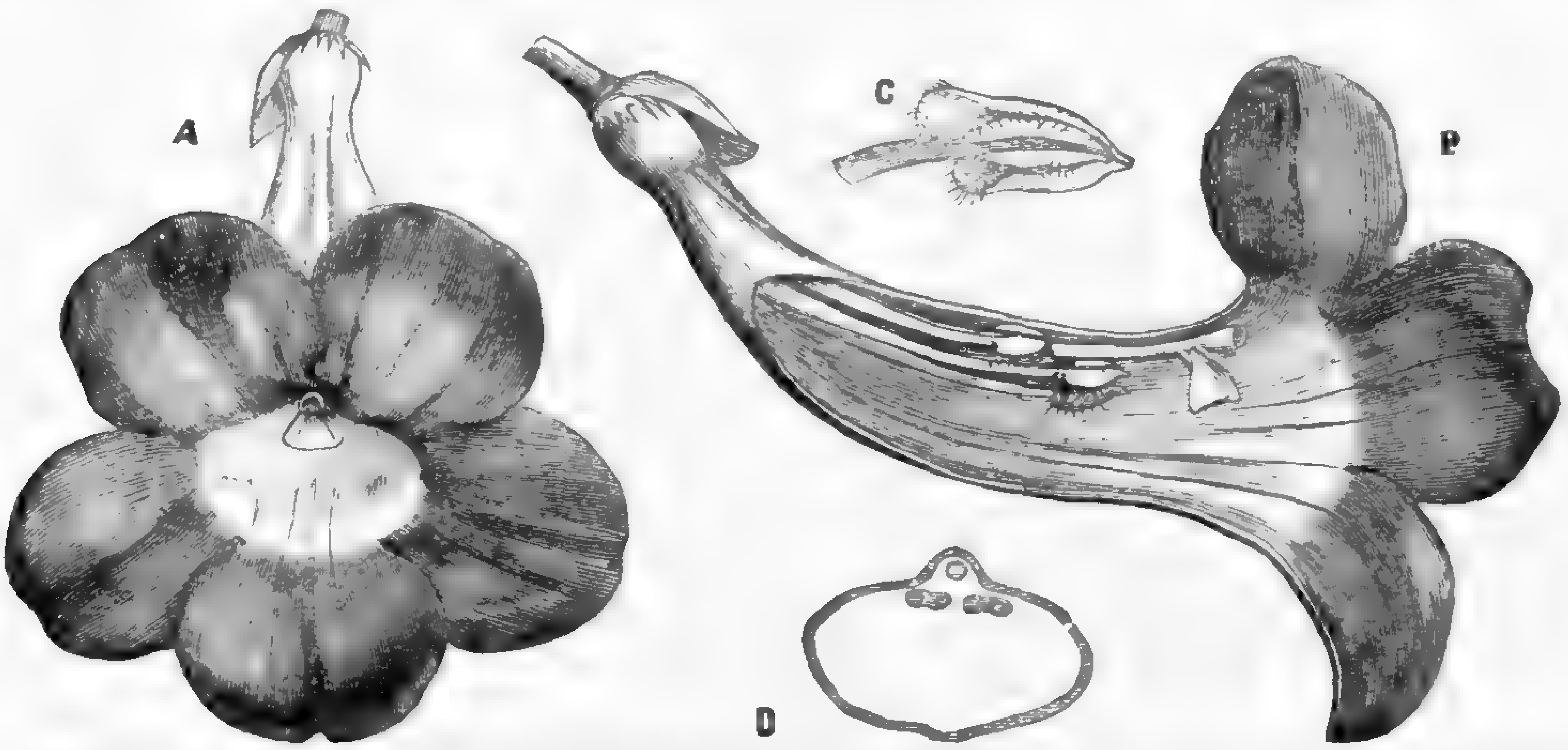
On the Mechanism for the Fertilization of *Meyenia erecta*, Benth.

By R. Irwin Lynch, of Kew Gardens. (Communicated by Dr. J. Murie, F.L.S.)

[Read April 18, 1878.]

I have the pleasure of bringing before the notice of the Society, in the flowers of *Meyenia erecta*, a previously unobserved mechanism to the end of cross-fertilization; and by means of the accompanying woodcut I trust I shall be able in a few words to convey a sufficiently intelligent description. The corolla is funnel-shaped, slightly curved, and lies in a nearly horizontal position. The anthers are placed about midway in the tube, and their backs are pressed against its upper wall. The style is slender * and flexible; it equals the tube in length, and runs along a little groove, as it were, in the roof; so that the peculiar stigma is placed just at the mouth and immediately over it.

Now comes the most important part of the mechanism. The stigma consists of two lips; the upper is folded into a tube and points straight forward. Through this lip alone is it possible for the pollen to fertilize the ovules. Pollen touching the lower lip would seem here to be of no avail. What, then, is its use? It will be seen, in contrast to the other, that it is spread open and projects downwards over the entrance to the tube; and its use is to act as a lever, in this way:—If an insect



Sketches of the flower of *Meyenia erecta*, to illustrate points connected with its mode of fertilization. A. Flower from above, foreshortened view. B. Lateral view of the flower in section, showing position and form of pistil and stamens. These two figures are about natural size. C. Anther, enlarged. D. An ideal transverse section to show the relative positions of pistil and stamens.

* In the drawing somewhat stouter than obtains in the natural object.

alights on the limb and essays to enter, in so doing the lever is pushed in, so that the receptive surface of the upper lip is brought down on its back, where lies a supply of pollen from another flower. In this way, then, pollenization is secured. Passing on, the insect releases the lever, and the stigma assumes its former position. Now we have to see how, in the first place, the back of the insect became charged with pollen. In going to and returning from the nectar at the bottom of the flower, it would evidently brush the pollen off the hairs of the anthers above, by which it has been retained. This, then, is the use of the anther-hairs; had the pollen fallen to the floor of the tube, it could not have been carried away. The insect now has to pass out, and again the lever-lip of the stigma comes into action. Just as it effected pollenization when the insect entered, so now it prevents contact of the pollen of its own flower. It is easily seen that the upper and receptive lip is pushed up out of the way by pressure from within against the lever.

Under the microscope, I find that the edges of the two lips appear to be different; the papillæ of the receptive lip are shorter than those of the lever-lip and its edge is thickened. I am indebted, however, to bright weather for a strong confirmation of the mechanical views I have above expressed. I have then observed that the receptive lip has been bathed with mucous while the lever-lip has been quite dry; the one has thus been shown to be receptive and the other not.

I have the support of Mr. Charles Darwin, to whom I have shown the specimens, in saying that this peculiar structure so far is thus apparently correctly explained. It appears to me evident, and perhaps admits of little doubt, though on first examination I failed to appreciate clearly the beauty and use of the peculiar mechanism in question. Even to give positive and undeniable proof is no easy matter, inasmuch as I have not been able to follow the precise steps in the ingress and exit of the insect: for, be it remembered, the plant is a tropical one, and the plant in this country placed in a conservatory; as a consequence it is extremely inopportune and difficult successfully to notice the mechanism in the act of use under natural conditions.

I have attempted to fertilize flowers, but without success; and this result is due, no doubt, to the dark weather of winter, and perhaps to a loss of vital force consequent on the artificial conditions of cultivation. Of this view there appears confirmation in

the small number of pollen-grains produced. I believe I am correct in stating that no seeds have ever been produced by any means in a state of culture.

Meyenia erecta is an Acanthaceous shrub of western tropical Africa, and it has purple or white flowers.

On the Seed-structure and Germination of *Pachira aquatica*. By R. Irwin Lynch, of Kew Gardens. (Communicated by Dr. J. Murie, F.L.S.).

[Read May 2, 1878.]

(Plate VIII.)

Comparatively few observations have been made on peculiar seed-structure and germination, and therefore I bring before the Society an example possessed of much interest. The structure of the seed is of the highest importance, seeing that all that follows in germination may be looked on as an evident consequence.

The seeds now in question were received at Kew from Honduras in July of last year as those of the "Provision Tree"; but to what tree this appellation is properly applied I was at first unable to discover, though being, without doubt, from the aspect of the young plants, a species of *Pachira*. Specimens in flower, sent by request for the purpose of identification, show it to be *P. aquatica*.

The seeds vary in size and slightly in form, apparently from position and compression in the fruit. They are without albumen, and consist in bulk of but one cotyledon, which is very fleshy and lobed, in a manner well shown by the sketches in Plate VIII. This cotyledon is evidently a store of much nutriment, and, after germination, persists a long time. The other, on the contrary, soon falls and appears to have little or no function; it is always diminutive in size, and is not fleshy. The cotyledons are not quite opposite; the smaller is always the highest, and is also attached a little on one side towards one or other of the angles of the larger, which it embraces by its under face. The larger cotyledon determines the form of the seed, and requires particular description. Typically it has one plano-convex fold at right angles with the attachment, forming half of the spheroid of which the whole may be said to consist. There are, then, two lateral lobes or folds which together form the other half of the spheroid, each

having a nearly plane face where they meet in front of the axis. In some seeds the folds form an acute angle with each other; in other cases a rounded floor lies between. An idea of this formation may be taken by supposing a reniform flat cotyledon, such as is commonly seen, the upper half and lobes of which are folded upwards by a transverse line and then thickened to assume the form of these seeds.

Germination takes place in about a fortnight after sowing; the small cotyledon soon falls away, while the larger of the two persists, and in one case was exhausted only at the end of nearly six months.

In the Kew Museum are germinating seeds of a species of *Pachira* which show, but slight deviation from the usual structure of seeds; cotyledons similar in all particulars. They show, however, an approximation to the structure of which the present case is an extreme. One cotyledon is half the size of its fellow, is attached a little higher up, and the larger is slightly corrugated. For further comparisons, consult the figures described in the accompanying Plate. The materials are preserved in No. 1 Museum of the Royal Gardens.

Pachira belongs to the tribe or suborder Bombaceæ of Malvaceæ, and comes between the well-known genera *Adansonia* and *Bombax.*

DESCRIPTION OF PLATE VIII.

Fig. 1. Commencement of germination, showing position of small cotyledon.

2. Section through large cotyledon, showing attachment and the relative position of small cotyledon.
3. Upper-face view of small cotyledon.
4. A side view of the same.
5. Young plant with cotyledon still attached.
6. Cotyledon of same plant reduced to three fourths natural size. A rounded floor is seen between the folds, in contrast to fig. 2, where the folds make an acute angle with each other.
7. *Pachira*, sp., in Kew Museum above referred to. It shows the adherence of two others of arrested growth, resulting from the production of several embryos on the same seed.

On *Marupa*, a Genus of the Simarubaceæ.

By John Miers, F.R.S., F.L.S., &c.

[Read May 2, 1878.]

(Plates IX. & X.)

In 'Trimen's Journal' (1873) I gave a hasty and very incomplete notice of *Marupa*, and I now contribute more complete details of

this very curious genus. On examining the vegetable products in the Brazilian collections sent to the Paris Exhibition of 1867, partly under my charge, I noticed a singular fruit preserved in alcohol, numbered 438 in the French Official Catalogue, p. 75, a specimen contributed by Señores Souza and Almeida from Pará, and ticketed "Marupá ou Simarubá"; and among the samples of wood was one from the same contributors, marked "Marupa" and "Pao pombo," so called because the fruits of this tree are eagerly devoured by wild pigeons.

The solitary, oblong, gibbous fruit is very little smaller, but of the same shape as that of *Samadera indica*, described and figured by Gærtner*. Both are essentially alike in structure, though very different in their development: in Gærtner's plant the pericarp is very thick, homogeneously integral, and subcoriaceous; while in the Pará fruit it is disintegral, being separated into a very thin pergamineous bladder-like epicarp and a distinct pellicular endocarp, the intermediate space being filled with a copious mucilaginous mesocarp.

In 1866, I noticed in the Ann. Sc. Nat. 5th ser. vol. v. p. 85, a memoir by Senh. Netto describing a Brazilian plant in flower only, which I take to be congeneric with the *Marupa* of Pará; it is called by him *Odina Francoana*, and known to the natives by the name of *Pao pombo*: it has male flowers only, its fruit being unknown. It is evident that it cannot belong to *Odina*, as that is a Terebinthaceous genus near *Semecarpus*, and as its species all belong to India or Africa. The floral details given by Senh. Netto quite correspond with the characteristic outlines of the Simarubaceæ, so clearly defined by St.-Hilaire (Mém. Mus. x. p. 137); and from the evidence before us we may safely conclude that Netto's plant and the Pará *Marupa* are congeneric. Under this conviction, the following diagnosis is elaborated.

* 'De Fructibus,' vol. ii. p. 352, tab. 156 *c*. This genus, so well illustrated by Gærtner, is congeneric with the *Aruba* of Aublet, who figures the solitary fruit in a very incipient state of growth, and is very different from the *Samadera* of most botanists, which is the *Zwingera* of Schreber, whose numerous species really belong to *Quassia*. *Samadera* proper has been quite misunderstood by all botanists up to the present time, and is only explained in Gærtner's analysis. The *Samadera*, *Simaba*, and *Simaruba* of Planchon are ill-defined by him in his review of the Simarubaceæ (Lond. Journ. Bot. v. p. 560). His *Simaba cedron* (Kew Journ. Bot. ii. p. 377, tab. xi.) is probably the type of an undescribed genus allied to *Samadera*.

MARUPA, *nob.*—Odina, *Netto* (non *Roxb.*).

Flores diclini. In ♂, *calyx* parvus, glaber, profunde 5-fidus; *sepala* acuta, suberecta, persistentia: *petala* 5, alterna, triplo longiora, obovata, concava, carnosula, circa gynophorum patentia: *stamina* 10, petalis breviora, glabra; *filamenta* tenuia, ad squamulas totidem globosas extus affixa; *antheræ* parvæ, ovoideæ, bilobæ, lobis longitudinaliter dehiscentibus: *gynophorus* centralis, breviter columnaris, apice *ovaria* 5 sterilia gerens, quorum unum raro pseudopolygamum. In floribus ♀ *sepala* marium, persistentia: *petala* caduca aut nulla: *squamulæ staminales* 10*, illis marium simillimæ, ad insertionem staminum extus fossatæ *stamina* dein caduca: *gynophorus* centralis, altius columnaris, 5-sulcatus, fructum unicum et ovaria 4 sterilia sustinens. *Fructus* majusculus, subcompresse oblongus, gibbus, latere basali ventrali gynophoro insitus, suberectus, latere sub apicem depressione concava et lata signatus, ubi, in fundo, styli vestigium latet: *pericarpium* in partes distinctas solutum; *epicarpium* tenuiter pergamineum, translucens, latere ventrali a basi ad stylum, *chorda* latiuscula vasis nutritoriis repleta signatum; *endocarpium* diaphanum, pelliculare; *mesocarpium* intermedium copiose mucosum. *Semen* solitarium, oblongum, compressum, margine ventrali fere rectum, ubi sub apicem rostro brevi expanso et ab illo suspensum; *testa* conformis, ossea, in faciebus cancellato-rugosa; *raphe* margine ventrali linearis, a rostro ad *chalazam* basalem et unilateralem descendens; *integumentum internum* tenuissimum: *embryo* exalbuminosus, conformis; *cotyledones* 2, amplæ, plano-convexæ, accumbentes, apice breviter oblique sinuatæ; *radicula* supera, brevis, teres, sinui insita, et a latere ventrali aversam se ostendens.

Arbusculæ *Brasilienses,* trunco *magno* lignoque *subalbido utilissimo donatæ*; folia *majuscula, alterna, glabra, bijugatim pinnata cum impari*; foliola *elliptica, petiolata integra*; flores *axillares, minimi, albidi, monoici, glomeratim spicati, spicis superioribus efoliatis*; fructus *majusculus, physiformis.*

MARUPA FRANCOANA, *nob.*— Odina Francoana, *Netto, Ann. Sc. Nat.* 5th ser. v. p. 85. In Brasilia, prov. Minas Geraes in campos secus Rio San Francisco: *non vidi.*

A tree 20–25 feet high, with glabrous branches; leaves alternate, nearly ½ in. apart, 6 in. long, on a common petiole which is bare at its base for 1¼ in., and 1 in. between the leaflets, of which there are two pairs and a terminal one somewhat larger than the lateral leaflets; these are 3½ in. long, 1½ in. broad, on petioles 6

* These ten staminal scales are called by Senh. Netto a 10-lobed disk; but by analogy with all other Simarubaceæ, they must be held to be the scales upon which the stamens are affixed.

lines long. Spikes axillary, 2 in. long, bearing numerous, small, whitish flowers which are alternately proximate; the upper spikes are without leaves and form a pseudo-panicle. The structure of the flowers as in the generic character.

2. Marupa Paraensis, *nob.*—Maroupa *ou* Simaruba, *Souza & Almeida, Cat. Bras. Collect.* p. 75, sub no. 438, Para. *Vidi lignum* Páo Pombo dictum, et *fructus in alcohol; cætera invisa.*

No leaves were attached to the specimen indicated: this consisted of simple axillary racemes torn from a branch; its peduncle $1\frac{3}{4}$ in. long, having about 6 alternate pedicels 3–4 lines long, all void of flowers, except one that was fructiferous; its pedicel supporting the persistent portions of the flower, which consisted of 5, small, erect, acute sepals, 10 rounded fleshy scales of the stamens from which the filaments had fallen; these surrounded the short gynophore, bearing on its summit 4 minute abortive ovaries and a single mature fruit as already described: the pericarp is pale and translucent, 18 lines long, 12 lines broad: the putamen, which nearly fills the cavity of the endocarp, is 14 lines long, 8 lines broad, and 4 lines thick, is osseous, rugous, 1-celled, containing a single, flattened, suspended seed $7\frac{1}{2}$ lines long, 4 lines broad, as in the generic character.

DESCRIPTION OF THE PLATES.

Plate IX.

Fig. 1. A branch of *Marupa Francoana*, taken from Senh. Netto's illustration of his *Odina Francoana*, with an inflorescence of small male flowers: *natural size.*

2. A flower in bud: *enlarged.*
3. A flower matured and expanded, showing the calyx, petals, and stamens: *also magnified.*
4. An anther, seen behind;
5. The same, shown in front: *both highly magnified.*
6. The ten staminal glands or scales, two of them showing the filaments and anthers, all surrounding the gynophore, which supports five sterile ovaries: *magnified.*
7. A section of a flower, where sometimes one of the sterile ovaries becomes larger and bears a single effete ovule, thus approaching a state of hermaphroditism: *magnified.*
8. The effete ovule: *highly magnified.*
9. The ten staminal scales surrounding the gynophore, which supports five minute sterile ovaries: *much magnified.*
10. A diagram showing the relative positions of the several parts.

The same figures and numbers are here employed as those given in Senh. Netto's Plate, but here somewhat differently interpreted, by analogy with the structure seen in the female flower.

PLATE X.

Fig. 1. A female raceme of *Marupa Paraensis* bearing a ripe fruit: *natural size.*

2. The calyx, the ten gland-like scales from which the filaments have fallen and which surround the gynophore, upon the summit of which are seen the cicatrix of the fallen fruit and the four sterile ovaries.
3. The same parts, seen from above: *both magnified.*
4. A longitudinal section of the pericarp of the fruit, with the enclosed putamen removed to show the physiform pergamineous epicarp, the inner membranaceous endocarp, and the copious intermediate mucous mesocarp.
5. The same section with the putamen restored, showing it to be suspended from a point beneath the persistent style.
6. The fruit seen on its ventral edge, showing the chord of nourishing vessels passing through the basal attachment, and thence ascending to the hilar point of suspension of the putamen.
7. The putamen, seen on its face.
8. The same, viewed on its ventral margin, showing the longitudinal chord of nourishing vessels.
9. A longitudinal section of the putamen, with the enclosed exalbuminous embryo within its membranaceous inner integument.
10. A transverse section of the osseous putamen.
11. A side view of the embryo deprived of its integument, showing the minute superior deflexed radicle turning away from the ventral edge.
12. The same, enveloped in its integument, showing the point of its suspension, the short raphe ending in the laterally ventral chalaza.
13. An edge view of the plano-convex accumbent cotyledons. *All natural size.*

Remarks on Mr. Crombie's Paper on the 'Challenger' Lichens in Journ. Linn. Soc. vol. xvi. By JAMES STIRTON, M.D., F.L.S.

[Read December 6, 1877.]

WITH reference to Mr. Crombie's paper on the 'Challenger' lichens, commencing at page 211 of Linn. Journ. for 1877, perhaps I may be permitted (as on a similar occasion elsewhere) to make some remarks on certain items in it.

In the present instance I am taken somewhat at a disadvan-

tage; besides, it happens unfortunately that I am in possession of not more than a half of the 'Challenger' specimens sent to me, as in this proportion only were the samples divisible; and my first duty was, of course, to send to Kew all the types. As a counterpoise, to a small extent, I made microscopical preparations of the characteristic crustaceous lichens; and these, along with some notes taken at the time of investigation, will serve my purpose in a certain proportion of the cases on which I wish to comment.

Rocella patellata, Strn., and *Ramalina tenuior*, Strn., I consider good species.

Endocarpiscum aterrimum, Strn.—Why Mr. Crombie should object to the distinction "*aterrimum*" is beyond my comprehension, as in a dry state the squamules are black enough; and this is all that is implied in the term. The specific distinction has no diagnostic value. I need scarcely say I hold to *aterrimum*, and I am much mistaken if others do not agree with me.

The genus *Endocarpiscum*, founded by Nylander, rests, I allow, on very slender grounds apart from those of *Heppia*; but as it marks a peculiar habit, more especially when confined to the polysporous section (in which is *E. aterrimum*), it may be allowed to stand.

Lecidea teichiodes, Strn.—I was fully aware that the character of the thallus pointed to *Dirina*; but in view of the manifest discrepancies involved in the smooth, innate, concave apothecia, I felt myself constrained to yield. My microscopical preparation shows spores determinately 3-septate, and rather longer at times than I have indicated.

I have not yet reached that transcendentalism in lichenology which gives a predominance to the spermogonia in the determination of genera over the larger and more obvious characters afforded by the apothecia.

Lecidea epipasta, Strn.,=*L. epiplacodia*, Cromb.—I have a decided objection, both structurally and grammatically, to Mr. Crombie's amendment in the shape of *epiplacodia* (*Placodium* being essentially a noun and used exclusively as such); besides, if used as a noun, the accusative plural is scarcely correct. Further, I think my pedantry will be pardoned if I remind him that "*effusa*" is not the Latin equivalent of *epipasta*. (See Mr. Crombie's paper.)

Epipasta characterizes well the appearance of this tribe generally, and may accordingly stand as the specific distinction of one of them.

All this appears trivial enough and even out of place in such a subject as the present; but it should be remembered that the discussion has been forced on me by way of defence.

Lecidea thyrsodes, Strn.—Mr. Crombie has given the dimensions of an immature spore. Being more favourably situated, I selected the best of the three or four apothecia detected. Perhaps I have overstated the thickness a very little; but certainly Mr. Crombie has understated it. The dimensions of the spores may be stated as ·06–·085 × ·003–·0035 millim.

I find also that while the perithecium is complete in a young state, it is wanting, or very nearly so, at the base in a mature apothecium, whence my description, viz. "hypothecium incolor," is much nearer the truth. What has been already stated accounts for the darker thallus as described by me.

Opegrapha undulata, Strn.,=*O. dialeuca*, Cromb.—In this the margins are truly undulated in nearly every instance, while the spores are not determinately 7-septate, as stated by Mr. Crombie. In fact it very seldom happens that pluriseptate spores are determinately septate. By the way, it is rather curious that the same exception may be taken to Mr. Crombie's distinction *dialeuca* that he advances against *epipasta*, as there are several *Opegraphæ* dialeucous.

I have again examined what has been termed *Ramalina bermudiana*, and I cannot reconcile myself to its identification with *R. complanata* as Mr. Crombie does. I find the rufo-ferruginous reaction by K on the thallus is confined to the sorediod points on which it is immediate, while this reaction is developed much more slowly over the general thallus, and only shows through this by the medulla being so affected.

In *Lecanora chlaronella*, Nyl. (No. 13, Bermud.), Dr. Nylander founds the distinction from *L. chlaroterodes*, Nyl., in the fact that the former has an after vinoso-fulvescent reaction by means of iodine on the hymenial gelatine, while the latter has no such secondary reaction. My experience already tells me that this is a very unstable foundation. A solution of iodine very little stronger than usual will develop this secondary reaction in a pretty large proportion of such cases when a feebler one will not; and it should be remembered that it is very difficult, if not im-

possible, to keep the ordinary solution of iodine at a uniform strength. I have noticed also that lichens recently gathered in a living state show a greater tendency to the development of this secondary reaction, while occasionally, although rarely, the converse holds. Besides all this, the vinoso-fulvescent after reaction is perhaps the most common of all such, and betrays differences of tint which no combination of terms will serve to indicate. The estimation of tints nearly related is also difficult, different observers giving different estimates, and these, too, differing at different times. As I am engaged in experimenting in the same direction, I shall defer to another opportunity what I have to say further under this head.

Mr. Crombie is perhaps right in referring *L. cyanochroa*, Strn., to *L. endoleuca*, Nyl.; but the "stratum infra hypothecium" is purpurascent, and in the more recent state, when I examined the specimens, the epithecium was also purpurascent, or rather violascent, and not blackish.

Ramalina aulota, Strn., is said to be=*R. minuscula*, Nyl.; but as I have not seen a description of the latter, there is still a doubt.

Why Dr. Nylander should object to the term *noseriza* when he himself uses *rhypariza*, *chlorotiza*, &c. in exactly similar circumstances and from exactly similar Greek words, is beyond my comprehension. The apothecia have certainly a sickly colour; and this is all that is implied in the term. I need scarcely say I hold to *noseriza*.

Parmelia adepta, Cromb.,=*P. euplecta*, Strn. MS. p. 1.—Mr. Crombie must have seen the name *P. euplecta* on the paper enclosing the fragment he speaks of, the smaller half of which I retain; and yet he ignores my name entirely, as indeed, with two exceptions, he does the others throughout the MS.

The blackening of the thallus by K (also stated by me) is most likely owing to something abnormal, as I find that a second application on another part gives partly negative effects, while the medulla beneath the unaffected portion gives the reactions as stated in MS., viz. yellow in the upper white stratum and red in the lower very thin yellow stratum.

Verrucaria prostans, Mut., is the proper determination of the fragment in my possession, and not *V. cinchonæ*, Ach.

Melanotheca rhaphidiza, Strn., is a good species and not =*M. aciculifera*, Nyl. (see MS.). Mr. Crombie might have taken into

consideration the possibility that others had seen fully developed spores although he had not.

Stereocaulon cymosum, Cromb.,=*S.* (*Ceratocaulon*) *arborescens*, Strn. MS. p. 6.—This lichen was deposited in Kew and a description of it recorded long before Mr. Crombie could have received his specimen.

Neuropogon trachycarpus, Strn. MS. p. 7, is a good species.

Lecanora cyphelliformis, Cromb.,=*L. cypellioides* Strn., see MS. p. 13.

The only excuse Mr. Crombie has given for rejecting *cypellioides* is contained, as usual, in two words written in pencil on the MS., viz. "nomen informe"; and yet the composition is obvious enough, like a little cypellum.

As a professed classical critic, Mr. Crombie is singularly unfortunate in the present amendment. In the school to which he belongs, such an engrafting of a Latin affix on a purely Greek stock is regarded as a solecism.

There is one exception, however, which I think should be allowed, viz. the use of the Latin prefix "*sub*" to both Latin and Greek words or derivatives from either. This prefix is so handy, and has scarcely so neat an equivalent in Greek. Accordingly, I object to Nylander substituting *latypodes* for *sublatypea*, Leight.; besides, Dr. Nylander employs "*sub*" in nearly similar circumstances, viz. *subchlorotica*, *sublecideina*, &c.

Lecidea disjungenda, Cromb.,=*L.*, *subjiciens*, Strn. MS. p. 14.—I have not seen Mr. Crombie's description of *L. disjungenda*; but his remarks under No. 11, Kerguelen, leave little room for doubt.

Lecidea superjecta, Nyl.,=*L. ephizousa*, Strn. MS. p. 15.

Lecidea terebratula, Strn. MS. p. 16, is considered by Mr. Crombie as identical with *L. ephizousa*. I can scarcely agree with him, as the differences, although minute, are characteristic. This lichen puzzled me at the time of investigation.

Stereocaulon subcæspitosum, Strn. MS. p. 22, can scarcely be *S. mixtum*, Nyl., as the gonimia in the cephalodia are sirosiphoid, and not scytonemoid. It is rather strange, however, that scytonemoid threads have been detected on the *surface* of these cephalodia.

Lecidea canescens, Strn., was a slip for *L. candidescens*. Dr. Nylander has named the lichen *L. acunhana*.

Permit me, in the last place, through this medium to remind Dr. Nylander that *Lecanora vitellinella*, Nyl., described at p. 184 of the Linn. Journ. for 1876, ought to be changed, as the same

name had previously been given by Mr. Mudd to another *Lecanora*.

There are still several points in Mr. Crombie's paper of minor importance to which I might have adverted; but at present I have neither the leisure nor the inclination to do so.

Note on the Probable Migration of *Pinguicula grandiflora* through the Agency of Birds. By Prof. Allman, M.D., LL.D., F.R.S., President Linn. Soc.

[Read June 6, 1878.]

In the month of June 1877 I received from the co. Cork a considerable number of specimens of *Pinguicula grandiflora*, and planted them round the margin of a small pond at Parkstone in Dorsetshire.

They took admirably to their new locality, and for some months continued to flourish; but towards the end of autumn I was disappointed at finding that they began to disappear, and before winter was well advanced a large proportion of my plants had completely vanished.

A conversation with Prof. Thiselton Dyer led me to suspect that birds were the depredators; and that in this suspicion I did no injustice to the birds, became sufficiently obvious when a sudden visit to the pond would startle a Blackbird or Thrush from his occupation among the surrounding marsh-plants. On such occasions recent marks of beaks were visible in the peat, and sometimes a recently eradicated *Pinguicula* might be seen lying on the ground.

That the birds actually made away with the plants and did not confine themselves to a search for worms which might be concealed among their roots, may be concluded from the actual disappearance of most of the uprooted plants. It was chiefly after the plants had passed into the state of bulb-like buds, in which they continue during the winter, that they became liable to attack.

One fine patch, however, which had been partially protected by surrounding it with branches of trees, escaped destruction and threw up in abundance during the spring its beautiful blue flowers.

But what especially surprised me was the fact that during the last spring, at a distance of nearly a hundred yards from

the pond to where I had absolutely confined my specimens, a fine healthy plant of the *Pinguicula* with numerous vigorous flower-stalks had made its appearance. There is no possibility of the plant having been accidentally dropped there; and the only explanation I can offer is that it was carried there by a bird.

If this explanation be the true one, we have an important fact in the migration of a plant with a geographical distribution so limited and remarkable as that of *Pinguicula grandiflora* being thus effected through the agency of birds.

I have reason to believe that the Irish area has been gradually extending itself in an easterly direction; for the plant is now found considerably to the east of the limits within which the Irish botanists of the earlier part of the present century had supposed it to be confined—a fact which the transporting agency of birds would help to explain.

I believe that many parts of Dorsetshire and Hampshire are as well adapted to the growth of *Pinguicula* as the regions to which its natural distribution is at present confined, the Spanish peninsula with the northern slopes of the Pyrenees and the south-western parts of Ireland.

Many of the rarer bog-plants with which it is associated in its Irish locality are also found here, such as *Bartsia viscosa*, *Anagallis tenella*, *Campanula hederacea*, *Radiola millegrana*, *Pinguicula lusitanica*, and *Utricularia minor*.

I am not aware of living specimens having been hitherto introduced into this part of England; and it is possible that with their tendency to migrate, my plants may become a centre from which *Pinguicula grandiflora* may establish itself in the moors of Dorsetshire and Hampshire. No one can regret the extension of so beautiful a plant; but as its occurrence in the south of England may become a source of perplexity to the future student of phytogeography, I have thought it my duty to place on record the date and manner of its introduction.

On two Kinds of Dimorphism in the Rubiaceæ.

By CHARLES BARON CLARKE, M.A., F.L.S.

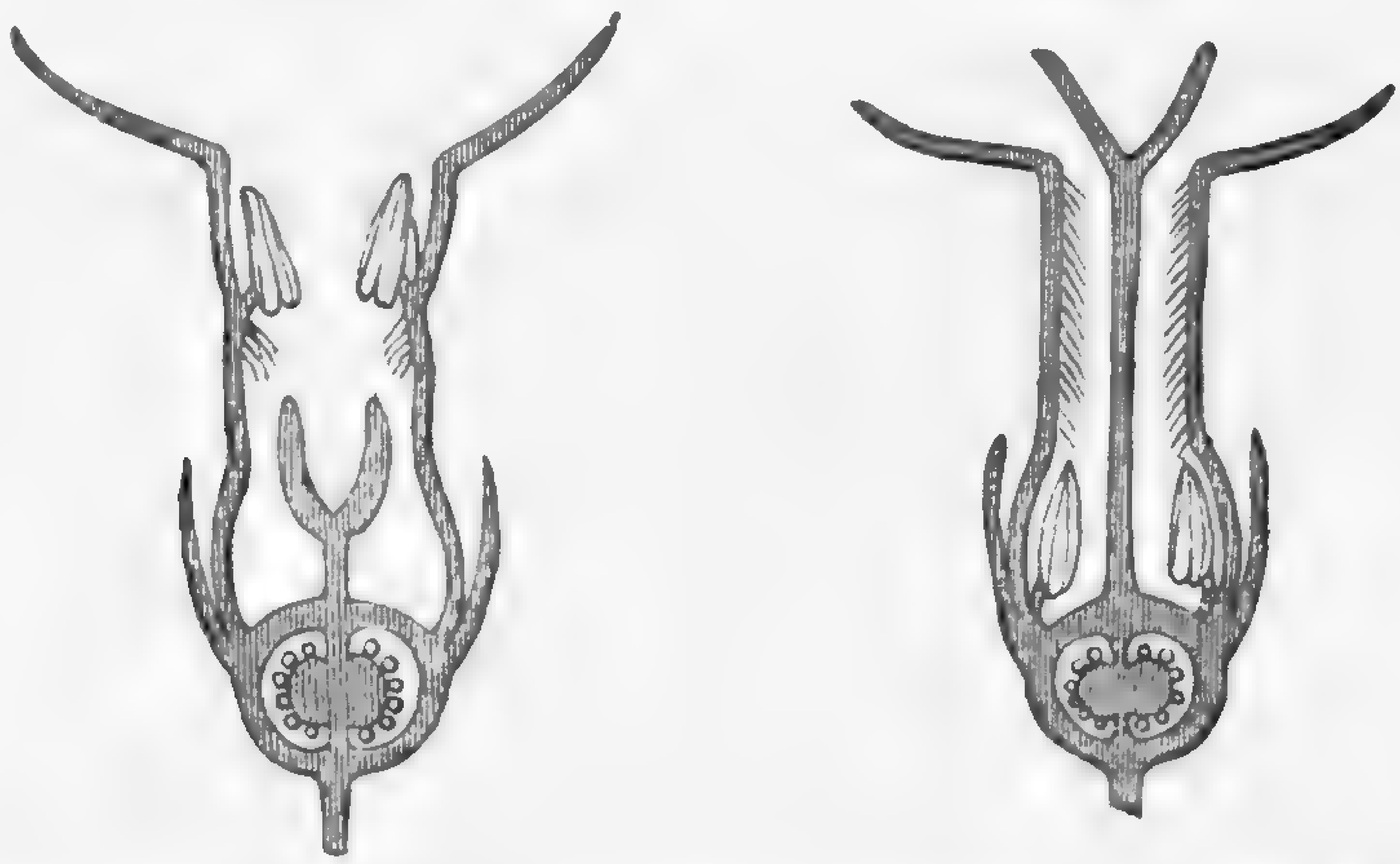
[Read June 20, 1878.]

MR. DARWIN has described, under the name dimorphism, the case where one species possesses two kinds of flowers, viz. one with long filaments and a short style, the other with short filaments and a long style. These are reciprocally fertile; and such dimorphism forms one of the routes towards dioicism. This kind of dimorphism is found in many natural orders, and is very frequent in the Rubiaceæ, as in the type genus *Cinchona*.

In this kind of dimorphism the differences between the two forms of flower are of slight systematic importance; the older authors have used the character of longer or shorter style, longer or shorter filaments, to distinguish species in genera where many (if not all) species possess both kinds of flowers. In the case, however, of the genus *Adenosacme* the dimorphism is of a different kind, affecting a character of first-rate systematic importance, viz. the point of insertion of the stamens. Here the short-styled form has the stamens inserted high on the corolla-tube; the long-styled form has the stamens attached at the very base of the corolla-tube, almost free from it.

Adenosacme is a genus of small shrubs; *A. longifolia*, Wall., is common in Sikkim and Khasia, where I have often examined the fresh flowers. Fig. 1 is a copy of a vertical section of the short-styled form noted on one of my field-tickets; fig. 2 of the long-

Fig. 1. Fig. 2.



Diagrammatic representation of vertical sections of the flower of *Adenosacme longifolia*. Fig. 1, short styled, and fig. 2, long-styled variety. Both × 5 diameters.

styled. In the latter the stamens are very nearly, or quite, free from the stamen-tube and stand on the ovary. The anthers and the ovaries and ovules in the two forms are indistinguishable, as are the fruits.

Of *Adenosacme*, Hook. f., in Bth. & Hk. f. Gen. Pl. i. 69, gives as part of the generic character, "Stamens inserted on the middle or above the middle of the corolla." On the other hand, Wallich, in his description of *A. longifolia* (under the name *Rondeletia*, in Roxb. Fl. Ind. ed. Carey & Wall. ii. 137), states, "Stamens inserted at the base of the corolla-tube; filaments very short; anthers oblong, not elevated beyond the height of the calycine laciniæ." The Deccan species of *Adenosacme* is *A. acuminata*, figured by Wight under the name *Lawia* (Wight, Icon. 1070); Wight thereunder states the stamens are at the very bottom of the corolla-tube, but gives *two* dissections in his plate showing the stamens quite free from the corolla, standing directly on the top of the ovary. Wight was clearly surprised at such a position of the stamens in the order Rubiaceæ. I suppose that I have explained the extreme contradiction in the statements of Hooker, Wallich, and Wight regarding this genus.

In examining again the dried flowers, I find that in my long-styled examples of *A. longifolia* the corolla easily separates, leaving the stamens standing on the ovary: the pollen of these appears perfect, and like that from the short-styled form. The long- and short-styled forms are in all my examples produced on separate individuals.

I need not occupy the time of this Society by enlarging on the systematic value attached to the distinction between stamens on the corolla-tube and stamens on the disk, which in the genus *Adenosacme* fails us even as a specific character. Dimorphism is here carried to a degree which I have not seen before noticed.

The second kind of dimorphism is perhaps yet more worthy of note, as it is carried into the fruit.

Randia uliginosa, DC., is a small tree very common in the swamps of Bengal. I at first supposed there were two curiously similar species. My lamented friend Sulpicius Kurz states (in his 'Forest Flora of British Burma,' ii. 45) that some trees produce sessile flowers succeeded by fruits the size of a hen's egg; other trees long and slenderly pedicelled flowers succeeded by fruits about half the size of the former. This is so; the sessile flowers (fig. 3) have the corolla-tube longer with a long style, the stigmas

separate; the peduncled flowers (fig. 4) have the corolla-tube and style very short, the stigma clavate with spiral lines. The small fruits contain perfect seeds exactly resembling the seeds of the

Fig. 3.

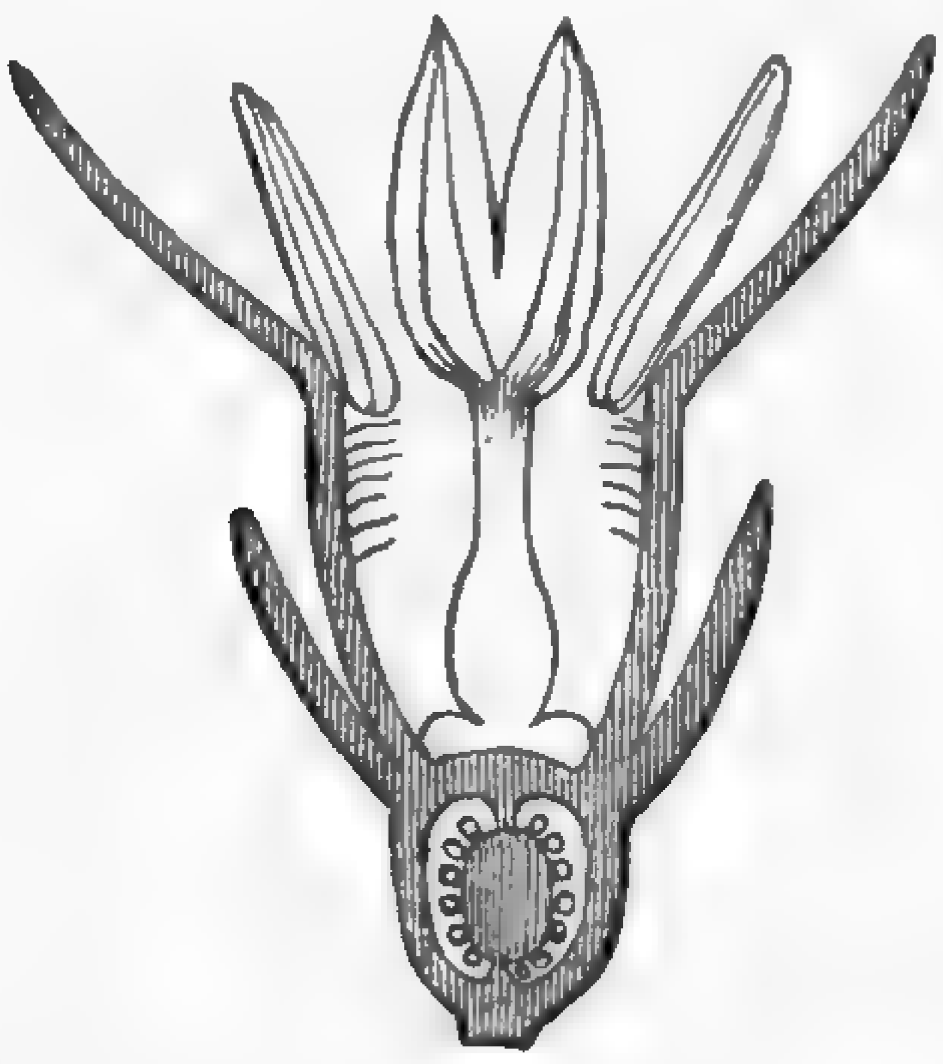
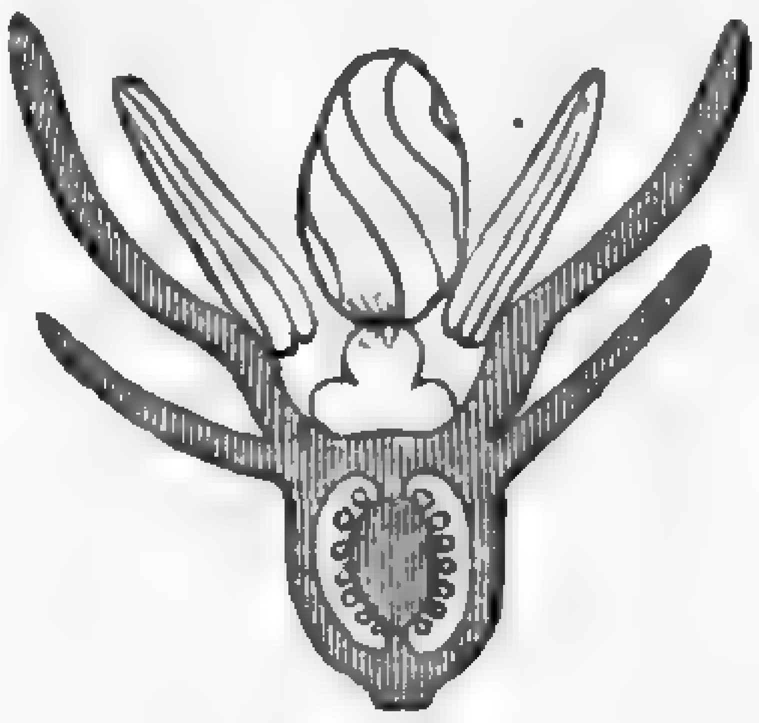


Fig. 4.



Diagrams of flowers of *Randia uliginosa.* Fig. 3, sessile-flowered, and fig. 4, peduncled-flowered variety. Both × $1\frac{1}{2}$ diam.

larger fruits. In this species all the peduncles are 1-flowered. But in the closely allied section of *Gardenia* (called by Kurz the subgenus *Randioides*) the fertile trees have the hermaphrodite flowers sessile, solitary, producing large fruits; the other kind of trees (called by Kurz hermaphrodite-sterile) have the flowers cymed and usually sterile; Kurz says always sterile; but there is one example at Kew in which the terminal flower of the cyme has produced a fruit smaller than the typical fruit of the species (*G. erythroclada*, Kurz), but apparently quite perfect. We are here on the boundary line between dimorphism and dioicism; but Kurz says that in one closely allied species (*G. sessiliflora*, Wall.) the two kinds of inflorescence and flowers occur on one tree.

In the Rubiaceæ it frequently happens that the stigmas are more or less combined or separate in the same species or individual; when combined, there is usually seen a straight, or nearly straight, line on each side along which they separate upon the application of a little pressure. But in other species of Rubiaceæ a clavate stigma with convolute linear markings, as in fig. 4, occurs; and I do not know that such stigmas ever become bifid. I should add that figs. 3 and 4 are copied from field-notes, and are accompanied by specimens by which they can be verified in the particular cases; but I am by no means sure that the larger (or rather longer) flower occurs invariably sessile, the smaller flower peduncled, though, so far as I recollect, it is so. I fear

the present communication will not assist much in the discrimination of the species and genera of Rubiaceæ, except as a caution to systematists to rely absolutely on no single character.

The Stapelieæ of Thunberg's Herbarium, with Descriptions of four new Genera of Stapelieæ. By N. E. Brown, Herbarium, Royal Gardens, Kew. (Communicated by Professor Oliver, F.R.S., F.L.S.)

[Read June 20, 1878.]

(Plates XI. & XII.)

A portion of Thunberg's herbarium being loaned to Kew by the kindness of Dr. Th. Fries, of the University, Upsala, for the purpose of working up the South-African flora, I have availed myself of the opportunity to examine the plants placed by Thunberg in the genus *Stapelia*. The species are 11 in number, consisting of all those described in Thunberg's 'Flora Capensis,' and one other, viz.:—*S. pilifera*, L.; *S. mammillaris*, L.; *S. incarnata*, L.; *S. hirsuta* (three species under this name); *S. ciliata*, Thbg.; *S. fasciculata*, Thbg.; *S. variegata*, L.; *S. caudata*, Thbg.; and *S. planiflora*, Jacq.

According to the present understanding of the genus *Stapelia*, I find that only five of these species properly belong to it, viz. *S. variegata*, *S. planiflora*, and the three included under the name *S. hirsuta*; the other six belong to five other different genera, two of which are herein characterized for the first time.

Stapelia mammillaris, L., I find to be identical with *S. pulla*, Mass.; both names have been placed under the genus *Piaranthus*; but this genus has been entirely misunderstood by all authors. The confusion that has arisen since it was first characterized by Robert Brown in 1811 was really begun by Robert Brown himself; for after describing the flowers as having no outer corona ("*corona staminea simplex, 5-phylla, foliolis dorso dentatis*"), he stated that the only species certainly belonging to the genus were *S. punctata* and *S. pulla*, Mass. Unfortunately Masson's specimen of *S. punctata* does not now exist; but Sir Henry Barkly has sent to Kew a species from Namaqualand which seems to be identical with Masson's plant; and this has a corona that exactly agrees with R. Brown's character above quoted: on the other hand, *S. pulla* has a very different corona, which does not agree with the character "*corona simplex.*" Of this species I have examined a

specimen in spirit at the British Museum, another in spirit at Kew sent by Sir Henry Barkly, and two living plants sent home by the same gentleman which flowered last year: in this plant there is a distinct outer corona, the lobes of which are connate in a cup, and adnate to five dorsal tooth-like projections from the lobes of the inner corona; besides this, *S. punctata* and *S. pulla* differ widely in habit, as may at once be seen on glancing at Masson's figures. The year after R. Brown's paper was published, Haworth published his 'Synopsis Plantarum Succulentarum,' wherein we find he has placed only *S. pulla* in the genus *Piaranthus*, and *S. punctata*, together with *S. decora* and *S. geminata*, Mass., he places in his new genus *Obesia*; and here he is right; for these three species are undoubted congeners: but the characters of *Obesia* are exactly those of *Piaranthus*; therefore as the latter genus claims priority, and the *Obesiæ* are the only plants that agree with the character on which it was founded, *Obesia* must rank as a synonym of *Piaranthus*. Matters have been further complicated, first by the erroneous description of *Obesia* given by Decaisne in DeCandolle's Prod. viii. p. 661; secondly, by Mr. Bentham, in the 'Genera Plantarum,' having placed it as a synonym of *Podanthes*, from which it materially differs in wanting the outer corona possessed by that genus, *Podanthes* being closely related to *Stapelia* § *Orbea*; and it must, I think, only constitute another section of that heteromorphic genus. I here add emended characters of the genus *Piaranthus*.

PIARANTHUS, *R. Brown* (non alior.).—Obesia, *Haw.*

Calyx 5-partitus, basi intus 5-squamatus. *Corolla* rotata vel campanulata, alte 5-fida. *Corona* simplex (exterior deest), 5-loba, lobis dorso dentato-cristatis.—Herbæ Africæ australis, carnosæ, *Duvaliarum* habitu.

Hic pertinet *P. punctatus*, R. Br.; *P. decorus*, Mass.; *P. geminatus*, Mass.; *P. serrulatus*, Jacq.

Stapelia mammillaris, L. (*S. pulla*, Mass.), I propose to place for the present in the genus *Boucerosia*, of which, with a few other species, it will form a section, characterized by the narrow corolla-lobes, included gynostegium, and stems armed on the angles with stout spine-like teeth. I prefer this rather than erect it into a new genus; for, from the material at Kew, it is evident that either a number of very closely allied genera will have to be established, which is undesirable, or the forms must be grouped into sections under one genus.

In the following descriptions I have arranged them (and numbered in brackets) in the same order they are described in Thunberg's 'Flora Capensis.'

I take this opportunity to gratefully acknowledge the numerous obligations I am under to Prof. Oliver for the kindness with which he has always assisted me in cases of difficulty, not only as regards the subjects of this paper, but on many other occasions when difficulties have arisen in working out this somewhat troublesome group.

TRICHOCAULON, *N. E. Br.*, gen. nov.

Calyx 5-partitus, basi intus 5-squamatus, segmentis acuminatis. *Corolla* patelliformis aliquando tubo brevi instructa, alte 5-fida; lobis late ovatis, cuspidatis, valvatis. *Corona* duplex, breviter stipitata; exterior alte 5-loba, lobis basi breviter connatis alteque bipartitis, segmentis valde divaricato-arcuatis; interioris lobi 5, ligulati, coronæ exteriore antherisque basi adnati, apice obtusi liberi incumbentes. *Caules* humiles, crasso-carnosi, multangulati, angulis tuberculatis, tuberculis aculeatis. *Flores* parvi inter angulos prope ramorum summum subsolitarii, brevissime pedicellati.

Species 2, Africæ australis incolæ.

As a genus, this will stand next to *Hoodia*, of which it has the habit; but differs from that genus as follows:—The corolla is very much smaller and deeply 5-lobed instead of truncate, and the lobes of the outer corona, instead of being shortly bifid, are deeply bipartite, and the two narrow segments so formed are horizontal and widely divergent-curved, the apex of one segment of one lobe touching, or nearly so, the apex of one segment of the adjacent lobe, so as to present the appearance of a pair of mandibles, as is noticed by Thunberg.

Flores fusco-purpurei .... *T. piliferum.*
Flores flavi........ .... *T. flavum.*

(1.) T. PILIFERUM. (Pl. XI. fig 1.)

Corolla diametro 7–8 lin., tubo brevi instructa, extus levis, intus papillato-rugosa, fusco-purpurea; corona purpurea.—Stapelia pilifera, *Linn. Suppl.* 171; *Thunb. Fl. Cap.* ii. 165; *Mass. Stap.* 17, t. 23.—S. (Gonostemon) pilifera, *DC. Prod.* viii. 655.—Piaranthus piliferus, *Sweet, Hort. Brit.* 359.

Hab. in Karoo trans Hartequas Kloof et infra Roggefeldt Bergen (*Thunberg*, *Masson*).

Thunberg's specimen consists of two pieces of stem, one imperfect flower as shown in the drawing, and half of another flower.

This material being too imperfect to construct a genus from it, I have derived the generic character chiefly from a closely allied species sent to Kew by Sir Henry Barkly, of which the following is a diagnosis.

TRICHOCAULON FLAVUM, sp. nov. (Pl. XI. figs. 2–4.)

Corolla diametro 5–6 lin., sine tubo, extus levis, intus minute papillata, flava.

Hab. Karoo ? (*Bain* in Herb. Kew.).

The smaller yellow corolla, destitute of any tube, easily separates this species from its near ally *T. piliferum.*

BOUCEROSIA (§ PURISANTHA).

Char. sect. Corolla lobis angustis; *corona* duplex variabilis; *caules* 4–6-angulati, angulis spinoso-dentatis vel rarius inermibus.

(2.) B. (§ PURISANTHA) MAMMILLARIS. (Pl. XI. figs. 5–13.)

Ramis erectis, glabris, 6-angularibus; flores inter angulos fasciculati, pedicellis 1 lin. longis, glabris; corolla campanulata, lobis anguste lanceolatis, acutis, marginibus valde revolutis, erecto-patentibus, extus levis albida atro-purpurea marginata et maculata, intus lobis atro-purpureis, minute setoso-tuberculatis, tubo albido atro-purpureo maculato; corona atro-purpurea, exterior cyathiformis, 10-dentatis, interior 5-loba, lobis biramosis, ramis interioribus ad apicem in cornu breve productis, ramis exterioribus dentiformibus ad coronam exteriorem breviter adnatis.—Stapelia mammillaris, *Linn. Mant.* 216; *Thunb. Fl. Cap.* ii. 166.—Pectinaria mammillaris, *Sweet, Hort. Brit.* 357.—Piaranthus mammillaris, *Don, Gen. Syst.* iv. 114.—Stapelia pulla, *Ait. Hort. Kew.* ed. 1, i. 310; *Mass. Stap.* 21, t. 31; *Bot. Mag.* t. 1648.—S. (§ Pectinaria) mammillaris, *DC. Prod.* viii. 663.—Piaranthus pullus, *R. Brown in Wern. Soc.* i. 23; *Haw. Synop.* 44; *Benth. Gen. Pl.* 782; *DC. Prod.* viii. 650.

Hab. in rupibus collium prope Olyfants-rivier versus septentrionem, in Karoo juxta Hexrivier et alibi (*Thunberg*).

Thunberg's specimen consists of three bits of stem and one flower; on examination, I found this to be identical with the specimen of *S. pulla* in the British Museum (Pl. XI. f. 11), which I cannot separate specifically from the specimens sent to Kew by Sir Henry Barkly (Pl. XI. f. 7–10). Figs. 7 and 8 are respectively side and front views of the corona from one plant; figs. 9 and 10 are similar views of the corona from another plant. These outlines show how variable is the corona in different individuals of the same species; for beyond these differences in the coronas there was no difference between the stems and flowers of the two plants. Thunberg's specimen has a corolla like fig. 5 and a corona like

fig. 11; and as the stems are like Sir Henry Barkly's plants, and the only difference observable being in the curvature of the lobes of the inner corona, I conclude that they all form one species which is liable to coronal variation.

(3.) Boucerosia (§ Purisantha) incarnata. (Pl. XI. figs. 14–17.)

Ramis erectis, glabris, 4-angularibus, 6–8 lin. crassis; flores inter angulos fasciculati, pedicellis 1 lin. longis, glabris; corolla campanulata, pallide incarnata, lobis erecto-patentibus, lineari-lanceolatis, subacutis, convexis, extus levis, intus minute rugosa, ad faucem minute pilosa; corona flava, exterior 5-loba, lobis suberectis bifidis, interior 5-loba, lobis ligulatis subobtusis apice non productis.—Stapelia incarnata, *Linn. Suppl.* 171; *Thunb. Fl. Cap.* ii. 167; *Mass. Stap.* 22, t. 34.—Podanthes incarnata, *Sweet, Hort. Brit.* 358.—Piaranthus incarnatus, *Don, Gen. Syst.* iv. 114; *Dcne. in DC. Prod.* viii. 650.

Hab. Saldana Bay, in montibus juxta Compagnies post, prope Verlooren Valley et alibi (*Thunberg*, *Masson*).

The outlines of the flower and corona I have made from the dried flower, and the spreading of the corolla-lobes and lobes of the outer corona may not be quite as in life. As regards the outer coronal lobes in the flower examined by me, they were as shown at fig. 16; but their position in life is probably somewhat as shown at fig. 15.

(4.) Stapelia hirsuta.

Under this name Thunberg has confused three species, neither of which seem to be the true plant. His specimens are glued upon two sheets of paper marked *a* and *b*; on the first sheet are two species, on the second one. As they are not very well dried, it renders it almost impossible to recognize the species or describe them correctly; but the following is an attempt to characterize his specimens without at present giving them names; they all belong to the section *Stapeltonia*.

Sheet *a*, left-hand specimen. (Pl. XI. figs. 18 & 19.)

Stems pubescent, flowering near the base of the young branches. Pedicels 1½ in. long, pubescent. Calyx-lobes lanceolate, acute, pubescent. Corolla pubescent on the back; face rugose, densely villous in the centre; lobes lanceolate, acute, fringed with long simple hairs. The parts of the corona are as shown in the drawing.

Probably a slender species, as the specimen has a stem 5 in. long, 3–3½ lin. broad, with the teeth 2½–3½ lin. distant; the

corolla is about 2 in. diam., but is much shrunk in drying, and, when fresh, would be 3–4 in. diam. or more; in colour it seems to have been purple-brown, with transverse yellowish lines on the lobes (?), which are glabrous on the upper two thirds, the basal one third and disk being covered with fine, silky, matted, purple hairs; the parts of the corona are pallid, but that may be the effect of drying.

N.B. The flower is detached from the stem.

SHEET *a*, right-hand specimen. (Pl. XI. figs. 20 & 21.)

Stems pubescent, flowering near the base of the young branches. Pedicels $1\frac{1}{2}$ in. long, pubescent. Calyx-lobes lanceolate acuminate, pubescent. Corolla with the disk covered with woolly hairs; lobes ovate-lanceolate, acute, densely fringed with rather long simple hairs. Parts of corona as shown in the drawing; the lobes of the outer corona appear very short comparatively.

The specimen is merely a young flowering branch that has not attained its full proportions, being only $2\frac{1}{2}$ in. long, and slender in proportion, from which it is impossible to form a correct idea of the plant. The dried flower is 14 lines in diameter, but is probably very much larger when fresh; the lobes appear to be smooth on the face, and more or less covered with hairs; colour all faded.

SHEET *b*. (Pl. XI. figs. 22 & 23.)

Stems pubescent, teeth rather distant, flowering near the base of the young branches. Pedicels 4 in. long, pubescent. Calyx-lobes 7 lines long, linear-lanceolate, acute, pubescent. Corolla large, $4\frac{1}{2}$–5 in. diam., pubescent on the back; face rugose, dark purple-brown, with transverse yellow lines on the middle part of lobes; the disk and base of lobes densely covered with matted purplish or purple hairs. Parts of the corona as shown in the drawing dark purple-brown, with the tips of the inner horns paler. Perhaps the plant described in Thunberg's 'Fl. Cap.' ii. 168.

This may perhaps prove to be *Stapelia hamata*, Jacq.

DIPLOCYATHA, *N. E. Br.*, gen. nov.

Calyx 5-partitus, basi intus 5-squamatus. *Corolla* tubo campanulato, processu campanulato-tubuloso cum corollæ tubo æquilongo e fundo intus oriundo, lobis valvatis per anthesin patentibus. *Corona* duplex breviter stipitata, exterior 5-loba, lobis basi connatis, latis, bifidis; interior lobis

5, antheris basi adnatis, ovatis, incumbentibus. *Pollinia* subhorizontalia, tumida, semiorbicularia, caudiculis brevibus glandulæ ad appendices laterales affixa. *Caules* humiles, aphylli, crasso-carnosi, quadrangulares, angulis grosse dentatis.

Species 1, Africa australis incola.

(5.) Diplocyatha ciliata. (Pl. XII. figs. 1–3.)

Ramis decumbentibus, 1½–2 poll. longis, glabris; pedicellis 6–8 lin. longis, erectis; lobis calycinis lanceolatis, acutis, glabris; corolla 3 poll. diam., "extus levis viridi-purpurascens, intus cinerea papillosa, scabra, papillis apice rufescentibus" (*Thunb.*), lobis ovatis acutis albo-ciliatis, ciliis clavatis, processus tubulosus margine revoluto crassissima, integerrima, "intus extusque papillis apice purpurascentibus, muricatus" (*Thunb.*), fundo circa genitalia dense barbata. Coronæ exterioris lobis erecto-patentibus transverse oblongis, bifidis vel bidentatis, dentibus subacutis, interioris crassis, ovatis, acuminatis, apice in cornu brevissime productis.—Stapelia ciliata, *Thunb. Fl. Cap.* ii. 168; *Mass. Stap.* 9, t. 1.—Tromotriche ciliata, *Sweet, Hort. Brit.* 358.—Podanthes ciliata, *Don, Gen. Syst.* iv. 118.—Stapelia § Podanthes, *Dcne. in DC. Prod.* viii. 655.

Hab. Karoo inter Roggefeldt et Paardeberg, et infra Bœklandberg (*Thunberg*, *Masson*).

A very remarkable plant, which only appears to have been collected by the two above-mentioned botanists. The large tubular process which arises from near the bottom of the corolla-tube was mistaken by Thunberg for the outer corona; but it is unquestionably analogous to the fleshy annulus arising from the corolla and surrounding the genitalia found in those species of *Stapelia* which form the § *Orbea*, such as *S. planiflora*, *S. variegata*, *S. marmorata*, &c.

(6.) Stapelia fasciculata, *Thunb. Fl. Cap.* ii. 170.—Piaranthus? fasciculata, *Schultes, Syst.* vi. 10; *Don, Gen. Syst.* iv. 113. —P.? fasciculatus, *Dcne. in DC. Prod.* viii. 650.

Hab. In collibus Hantum prope Roggefeldtsberg (*Thunberg*).

There is a specimen in Thunberg's herbarium without a name, consisting of two bits of stem, one of which bears two follicles 4 inches long on an erect pedicel 16 lines long. As this agrees exactly with his description of *S. fasciculata*, it must, I think, be that plant; but as there are no flowers, it is impossible to determine it, though, to judge from the specimen, it does not belong to the genus *Stapelia*, and may possibly be either a *Huernia*, *Duvalia*, or *Piaranthus*.

(7.) Stapelia (§ Orbea) variegata, *Linn. Sp. Pl.* i. 217, ed. 3, i. 316; *Thunb. Fl. Cap.* ii. 170; *Jacq. Stap.* t. 39, bona; *Dcne. in DC. Prod.* viii. 659.

Hab. in montium lateribus ad Leuweberg, prope Kafferkeuls rivier et alibi, vulgaris (*Thunberg*).

Specimens of this plant, both living and in spirits, collected on the Lion Mount (=Leuweberg) near Cape Town, were sent to Kew by Sir Henry Barkly. These agree exactly with Thunberg's specimen and with Jacquin's figure above quoted.

(8.) Brachystelma caudatum.—Stapelia caudata, *Thunb. Flor. Cap.* ii. 171.—Brachystelma crispum, *Grah. Phil. Journ.* 1830, 170; *Bot. Mag.* 3016; *Dcne. in DC. Prod.* viii. 647.

Hab. Africa australis.

Thunberg's description of the corolla, "Corolla plana, purpurea, intus squamosa," is so erroneous, that without seeing his specimen it would be impossible to identify it. The specimen, which is extremely well dried, shows that the corolla has a short tube and a rotate limb, the lobes of which are long and narrow with very revolute margins; the tips of the lobes are dull greenish, the basal part and tube yellowish spotted with dark purple-brown. By "intus squamosa," I suppose is meant the sparse pubescence on the apical half of lobes, consisting of minute rather thick hairs. Thunberg's specimen exactly agrees with *Brachystelma crispum*, Grah., as figured in the 'Botanical Magazine,' t. 3016; except that the leaves are slightly narrower and less undulated, there is no other difference.

Stapelia (§ Orbea) planiflora, *Jacq. Stap.* t. 40; *Dcne. in DC. Prod.* viii. 659.

Hab. Africa australis.

This is the only other *Stapelia* in Thunberg's herbarium, and the only one not mentioned in his 'Flora Capensis.' As it is identical with Jacquin's plant, it needs no further comment here.

Sarcocodon, *N. E. Br.*, gen. nov.*

Calyx 5-partitus, basi intus 5-squamatus, segmentis angustis, acutis. *Corolla* campanulata, quinquifida; lobis latis ovatis. *Corona* duplex, subsessilis; exterior 5-loba, lobis longis, angustis, basi breviter connatis, alte bifidis; interioris lobi 5, ligulati, coronæ exteriore antherisque basi adnati, apice membranacei obtusi vel emarginati liberi incum-

* The two following genera do not belong to Thunberg's Herbarium.

bentes. *Pollinia* subhorizontalia, subrotunda, tumida, caudiculis brevibus ad glandulam affixa. *Caules*? crasso-carnosi. *Flores* magni, in cymis umbellatis sessilibus terminalibus dispositi.

Species 1, in terra Somalensi incola.

This genus may be distinguished from all others by its large bell-shaped corolla and a subsessile corona, whose outer segments are long and narrow with a deep linear notch. Its affinities are with *Boucerosia*.

SARCOCODON SPECIOSUS, *N. E. Br.* (Pl. XII. figs. 4–8.)

Pedicellis 2 lin. longis, crassis, basi bracteatis, bracteis $1\frac{1}{2}$ lin. longis, subulatis, minute barbatis; lobis calycinis lanceolatis, subacutis, pilis crassis minutis sparsim obtectis; corolla diametro $1\frac{3}{4}$ poll., extus intusque levis, glabra, tubo amplo campanulato, lobis latis, ovatis, acutis, patentibus, marginibus revolutis pilis clavatis ciliatis; coronæ exterioris lobis anguste lanceolatis, $1\frac{1}{2}$ lin. longis, alte bifidis, segmentis parallelis, interioris lobis oblongis, truncatis, emarginatis vel obtusis.

Hab. Brava Magadoxo (*Dr. Kirk*! in Herb. Kew.).

The history of this plant is as follows:—In 1875 Dr. Kirk sent a box to Kew containing two living plants, which he stated in a letter to be two species of *Stapelieæ*. I saw these plants, and could not discover the slightest specific difference between them, nor could others at Kew; they were bushy plants about 16 inches high, with 4-angled leafless stems an inch or more thick, the angles with short stout teeth, and margined with a white subcartilaginous border. No flowers were sent with them, and the plants soon died. The following year Dr. Kirk sent to Kew, preserved in spirits, what were stated to be the flowers of the two living plants previously sent: one of these specimens belongs to the genus *Boucerosia*, the other is the plant above described. From the very small portion of stem sent with each inflorescence, it is impossible to be certain which belongs to the living plants sent (of which I have a drawing and a specimen in spirits); and it is just possible there has been some mistake, and that the living plants were quite different from either; for I can find no trace of the white angles on the small bits of stem sent with the flowers, and this is very conspicuous on the piece of stem I preserved in spirits from the living plants. From this cause I am unable to describe the stems of *Sarcocodon speciosus* in a satisfactory manner, as the only bit of stem that I can certainly identify as belonging to it is the small section shown on Pl. XII. fig. 5.

HUERNIOPSIS, *N. E. Br.*, gen. nov.

Calyx 5-partitus, basi intus 5-squamatus, segmentis lanceolatis, acuminatis. *Corolla* campanulata, 5-loba. *Corona* simplex (exterior deest), 5-loba, lobis crassis erectis simplicibus, antheris basi adnatis. *Pollinia* subhorizontalia, tumida, oblonga, caudiculis brevibus glandulæ ad appendices laterales affixa. *Caules* perhumiles, aphylli, crasso-carnosi, quadrangulares, angulis dentatis. *Flores* mediocres, cymosi, cymis paucifloris bracteatis ad medium ramulorum inter angulos sessilibus.

Species 1, Africæ australis incola.

H. DECIPIENS, *N. E. Br.* (Pl. XII. figs. 9–13.)

Ramis procumbentibus, 1–2½ poll. longis, ½ poll. crassis, plus minusve clavatis, glabris; pedicellis 1–3 lin. longis, crassis, glabris; lobis calycinis lanceolatis, acuminatis, glabris; corolla diam. 1 poll., extus glabra cineraceo-viridi, schistaceo vittata maculataque, intus saturate rufo-purpurea luteo variegata, lobis deltoideo-acuminatis, recurvatis, pilis clavatis basi ciliatis. Corona purpurea.

Hab. —— ? 2246, *MacOwan*!

This is a very curious plant, which I have cultivated several years without any knowledge of its native country until last year, when Prof. MacOwan sent to Kew a specimen in spirits from the Cape of Good Hope, but without exact locality. In habit, form, and size of stems it so much resembles *Duvalia polita*, that before it flowered I mistook it for a constantly 4-angled form of that plant: the flowers, on the other hand, are very like those of a *Huernia*, to which genus *Huerniopsis* is most nearly related; but the utter absence of an outer corona at once distinguishes it. In this latter respect it resembles *Piaranthus*, R. Br. (not of other authors); but the different habit, different corolla, and absence of dorsal crests to the lobes of the corona render it sufficiently distinct from that genus.

The flowers only remain open about forty hours and emit a very fœtid sickly odour, which is very similar to that of *Stapelia olivacea*, N. E. Br.

DESCRIPTION OF THE PLATES.

PLATE XI.

Fig. 1. *Trichocaulon piliferum*, outline of flower in Thunberg's herbarium; magnified 2 diameters.

2. *Trichocaulon flavum*, a bud; magn. 2½ diam.

3. Ditto, open flower; magn. 2½ diam.

Fig. 4. *Trichocaulon flavum*, corona; magn. 6 diam.
5. *Boucerosia* (§ *Purisantha*) *mammillaris*, open flower; natural size.
6. Ditto, portion of corolla-lobe; magnified.
7–10. Ditto, side and front views of coronas from plants sent to Kew by Sir H. Barkly; magn. 6 diam.
11. Ditto, corona from specimen preserved in spirits in the British Museum; magn. 6 diam.
12. Ditto, pollinia, as seen in natural position; magn.
13. Ditto, dorsal view of gland of pollinia; magn.
14. *Boucerosia* (§ *Purisantha*) *incarnata*, the flower.
15. Ditto, corona (half view), with the lobes represented in their probable position.
16. Ditto, corona (half view), with the lobes as found in the dried specimen.
17. Ditto, pollinia. All magnified.
18. *Stapelia hirsuta*, Herb. Thunb. (sheet *a*, left-hand specimen), lobe of outer corona.
19. Ditto, two lobes of inner corona from the same flower.
20. Ditto (sheet *a*, right-hand specimen), lobe of outer corona.
21. Ditto, lobe of inner corona.
22. Ditto (sheet *b*), lobe of outer corona.
23. Ditto, lobe of inner corona.

Plate XII.

Fig. 1. *Diplocyatha ciliata*, longitudinal section of corolla-tube; magnified about 3 diam.
2. Ditto, corona; magn. 10 diam.
3. Ditto, pollinia, with the gland bent out of its proper position; much magnified.
4. *Sarcocodon speciosus*, portion of an inflorescence; natural size.
5. Ditto, showing bud and portion of stem.
6. Ditto, bract; magnified 6 diam.
7. Ditto, calyx, showing the broad basal squamæ; magn. 4 diam.
8. Ditto, corona; magn. 3 diam.
9. *Huerniopsis decipiens*, portion of plant; natural size.
10. Ditto, entire corona; magn.
11. Ditto, one lobe of corona, side view; magn.
12. Ditto, one of the clavate hairs from corolla; magn. 13 diam.
13. Ditto, pollinia; magn. about 30 diam.

Observations on *Hemileia vastatrix*, the so-called Coffee-leaf Disease. By the Rev. R. Abbay, M.A., F.G.S., Fellow of Wadham College, Oxford. (Communicated by W. T. Thiselton Dyer, M.A., F.L.S.)

[Read June 6, 1878.]

(Plates XIII.–XIV.)

Historical Remarks.—One of the greatest scourges which the coffee enterprise of Southern India and Ceylon has had to contend with is, without doubt, *Hemileia vastatrix*, or the so-called Coffee-leaf disease. Appearing first on a new estate in Madulsima, a district in the south-eastern corner of the mountain-zone of Ceylon and bordering on the Low Country, it spread with remarkable rapidity over the various coffee-districts, attacking both old and young trees with almost equal severity. At first the "disease" was regarded by those best able to judge as a temporary one, which would run its course for a year or two, and then disappear as mysteriously as it came. This view was strengthened by the apparent departure of the pest when the rainy monsoon came on; but with the return of dry weather it reappeared. The effect of the disease presently became apparent in a diminution of the fruit which the tree yielded; and in 1872 the matter was recognized as serious. Previous to and including 1871 the average yield for five years over the whole island had been 4·5 cwt. per acre; whilst for the five succeeding years the average has only been 2·9 cwt.—a decrease in the production of somewhat more than one third. A portion of this decrease is believed to have been due to exceptionally unfavourable seasons for the blossoming and development of the fruit.

The following is an approximate list, showing the number of acres in cultivation, the total production of coffee, and the yield per acre during the three-year periods from the year 1866 up to the present time, 1867, 1870, 1873, and 1876 being the middle years of each period :—

	Acreage.	Production. cwt.	Yield per acre.
1866, 1867, 1868	170,000	728,440	4·28
1869, 1870, 1871	186,000	845,375	4·54

	Acreage.	Production. cwt.	Yield per
1872 } 1873 } 1874 }	221,000	648,877	2·93
1875 } 1876 } 1877 }	260,000	777,165	2·98

The present year (1878) is believed to be the most disappointing the coffee enterprise has known, the average yield, according to Ceylon statistics, being somewhat below 2 cwt. per acre. The promise for next year, however, is exceptionally good if the trees only have the strength and the favourable season for ripening their fruit.

It must be remembered that about one fifth of the above acreage of coffee is not in full bearing, on account of the trees being either too old or too young.

During the earlier years of the ravages of the pest all traces of it disappeared so completely in different districts, and the trees when relieved from its influence so readily put forth new foliage and bore considerable crops, that confident hopes were entertained that the mischief would soon and entirely pass away. This feeling was increased by the fact that no tree had ever been known to be killed by the "disease," however frequent and repeated the attacks might be. It soon, however, became evident that many of the trees so affected, more especially the old and decrepit, were losing a portion of their vigour—the crop reaching maturity, as shown by the statistics, being below the estimates formed by experienced men immediately after the blossom had set, an unmistakable sign that these particular trees were losing in some measure the power to perfectly ripen their fruit. Besides this, a somewhat larger proportion of light coffee, *i. e.* of deaf beans, was noticed. Planters consequently had recourse to a very liberal application of manure of various kinds; and the tree was thus enabled to bear a good crop of fruit, as well as to put out new leaves in the place of those of which it had been denuded by the pest. This method has been successful to a considerable extent; but the older and more feeble trees have, as might have been anticipated, in a large degree ceased to yield to the stimulus.

The deficiency in the value of the crop for the present exceptional year (1878), particularly on the older and low-lying estates, is greater than has been experienced before, and the average annual

deficiency in the whole island has been estimated by some as at least £2,000,000. Since the "disease" made its appearance in 1869, the enterprise has suffered to the extent of from £12,000,000 to £15,000,000 in crops alone; yet I believe there is not a single recorded instance of a tree having been killed by the pest; besides which it must be remembered that the seasons have been exceptionally unfavourable. The effect is simply to deprive the tree of its leaves, and slowly and surely to weaken it if the strength of the plant is not continually renewed by means of manure.

Absolutely nothing is known as to the origin of the pest beyond what has been already stated. It is found on no other plant except the coffee-tree, nor until some sixteen or eighteen months ago, when it appeared in Sumatra, in any other country except Ceylon and Southern India. From what follows in these pages as to the character of the "disease," it will, I am afraid, appear to be almost impossible that Java can escape the importation of it from Sumatra; but it is perhaps a matter of doubt whether the conditions of that climate are so favourable to its growth and development as those of Ceylon seem to be.

If such be the case, the production of coffee in the East, if not also in Brazil, may at no distant date be much restricted, unless, as is possible, some method should be discovered of successfully contending with the pest. The vitality of the spores of the fungus forming the "disease" is somewhat remarkable, and apparently places no limit to the distance to which they may be conveyed, or to the period during which they will retain their power of germination. The writer has at the present time (April 1878) spores growing readily which were sent from Sumatra to Ceylon sixteen months ago, and afterwards transmitted in the middle of winter to England.

General Description of the Coffee-Fungus.—At a very early date in its history Mr. Thwaites, F.R.S., Director of the Botanical Gardens at Peradeniya, in Ceylon, discovered that the pest was a fungus, with certain points of resemblance to the Uredineæ, whose mycelium permeated the tissues and fed on the juices of the leaf. Messrs. Berkeley and Broome described the fruit of the fungus in the 'Gardeners' Chronicle' for 1869, p. 1157; but the writer believes that no serious attempt has hitherto been made to grow the plant and ascertain its true character.

The first indication of the "disease" is a palish discoloration

in spots or patches, easily detected when the leaf is held up to the light. These quickly assume a faint yellow colour, and presently become covered with bright yellow dust, which soon turns to a rich orange. These are the ripening spores, or rather sporanges, of the fungus aggregated in little clusters, just visible to the unassisted eye, as shown in Plate XIII. fig. 1, which is a drawing taken from nature of a portion of a diseased leaf. One or two points of interest are suggested by a superficial examination of the character of the disease-spots. In the first place, they are nearly circular in form, the central portion being the oldest and losing its bright orange colour earliest, the black spot in the centre showing where an *aspergillus* has fixed itself on the more mature sporanges. The circular form and the regularity of the colour of these spots at equal distances from the centre suggests that the fungus has developed pretty equally on all sides from some central point. Again, it may be noticed that the midrib and nerves of the leaf form barriers, sometimes, but not always, beyond which the fungus-spot does not pass. This suggests that the infection must come from without, and not from the juices within the leaf itself; for it is improbable, if the latter were the case, that the nerves of the leaf could form barriers beyond which the disease-spot could not spread. It seems natural, therefore, to suppose, and the hypothesis is borne out by microscopic observations, that each disease-spot is the result of a germinating body which has fixed itself at a point which afterwards is the centre of the spot.

Microscopic Examination of Dry Specimens *.—If, in order to examine the character of the orange-red sporanges by means of transmitted light, the under cuticle of the leaf be torn off in the neighbourhood of a "disease-spot," the fungus will be found to present the appearance shown in Pl. XIII. fig. 2, each cluster (A) consisting of a number of orange-red sporanges and occupying a stomate of the leaf. Not infrequently every stomate is thus occupied, and the cuticle appears to be covered with an unbroken layer of sporanges. If now the specimen be turned upside down, so that we look at the inner surface of the cuticle, several indistinct and dark bodies are seen (fig. 3) immediately above the clusters just mentioned. From these bodies a branching mycelium, more or less charged with reddish-brown granular matter,

* Nearly all the observations have been made by means of a $\frac{1}{16}$-inch immersion-objective.

ramifies amongst the cells of the leaf. The tendency to form little sacs full of granular matter is noticeable, as is the fact that two of the dark bodies are connected by one branch of mycelium.

After examining many hundreds, I may truly say thousands, of these clusters of sporanges, I had the good fortune to break open the sides of a stomate and detach the perfect fungus from the cuticle. A glance showed the cause of all previous failures. The parts of the fungus within and without the leaf were seen to be connected by a narrow neck, which always broke when any attempt was made to detach the clusters or the dark bodies from the cuticle. Pl. XIII. fig. 4 shows the fungus thus detached—A, being the cluster of sporanges outside the leaf; B, the dark body filling the whole of the intercellular air-chamber behind the stomate; C, the mycelium attached to and carrying nutriment to B. Of the exact nature of the dark body B, I am unable to speak with accuracy. It seems to be merely an enlargement of the mycelium into the form of a sac of the shape and size of the air-chamber it occupies, and filled with dark-red granular matter conveyed to it by the mycelium-branches C. This view is partly confirmed by Pl. XIII. figs. 5 and 6, in which the tendency of the mycelium to form little sacs full of red granular matter is very decided. All these figures are from specimens obtained from the interior of diseased coffee-leaves sent from Ceylon. Fig. 5, I believe, shows one of the dark masses in process of formation, and before it has pushed its way through the stomate. The general character of the mycelium that permeates the intercellular spaces of the leaf is seen in fig. 7 (Pl. XIII.). Not infrequently, however, these branching masses of mycelium are so complicated that it is almost impossible to represent them on a plane surface. In one instance, in which the immature form of fig. 4 (Pl. XIII.) was detached from the growing coffee-leaf, the dark body C was found to be transparent and partially filled with red granular matter, some of which was observed to be passing up the neck towards the sporanges.

When one of the clusters of sporanges growing on the outside of the leaf has been removed and placed between two slips of glass, all the more mature sporanges may be detached by pressure and only the immature sporanges left. These may be seen, in Pl. XIII. fig. 8, attached by short pedicels to a central dark-red mass, which is no doubt the terminal portion of the dark body

protruded through the stomate. The most immature of the sporanges have few or no papillæ on them. Sometimes they contain no red granular protoplasm. At other times they are filled with it, as is seen in fig. 9, which represents a cluster of sporanges subjected to pressure until nearly the whole of the sporanges have been detached. Up to the present point only specimens from Ceylon have been described. On diseased leaves from Sumatra I have found a form of growth in connexion with the clusters of sporanges of a very remarkable nature. In Pl. XIII. fig. 10 is seen a cluster of sporanges similar to those described. To the left there is apparently a remnant of a branch of mycelium attached below to the cluster, whilst all round is a series of transparent bodies somewhat resembling the barren cysts in *Lecythea* and *Melampsora*, only they are here prolonged into fine tubes divided towards their extremities by a septum, beyond which are minute particles of red granular matter, as seen in Pl. XIII. fig. 11. It would appear from fig. 11 that there is a tendency to the growth of a new mycelium, which, like the old, contains dark-red granular protoplasm. One of the clusters from which most of the sporanges have been detached after being treated with potash may be seen in fig. 11. The dark-red mass which bears the sporanges is of an exceedingly compact character and its structure is very indefinite, some indistinct lines radiating from the centre being alone distinguishable. The attachment of one of the barren cysts is seen in fig. 12.

When the sporanges have been detached from the mass on which they grow, a portion of the pedicel is sometimes seen to be still attached to them, as in Pl. XIV. figs. 1 and 2, the latter representing an immature sporange devoid of papillæ. These sporanges vary considerably in shape, apparently on account of the varied pressure to which they are subjected during growth. They are papillated on all sides except the inner or concave surface. The sporange itself consists of an outer coat and an inner transparent membrane, which sometimes, but very rarely, become detached from each other entire. More frequently the outer coating disintegrates, and the inner membrane opens out and slowly dissolves away. Generally, however, the outer coating remains, even when immersed in water at a temperature of 90° F. for weeks, and at last falls to pieces, the inner membrane apparently disappearing at the same time, or having disappeared previously. The papillæ are very minute bodies, pointed at the

extremity by which they are attached to the sporange. The length of the sporange varies somewhat from slightly less to slightly more than ·001 inch in length. (It may be noticed here that, as all the measurements have been made by comparison with the length of the sporange and not by means of a micrometer, there will be a certain amount of inaccuracy attached to them.) On examining the sporange under a high power, it is seen to be more or less filled with dark-red granular matter, in which one or more globose bodies with nuclei may be detected (Pl. XIV. fig. 3).

Sometimes a large semitransparent mass of protoplasm is seen in the sporange. It appears to be quite structureless, and varies very much in size and shape. In some cases the whole of the interior of the sporanges is seen to be filled with granular matter without a single spore amongst it. On placing the sporanges in a drop of water between two slips of glass and subjecting them to considerable pressure, the membrane becomes ruptured, and the spores make their escape. They are then found to have been attached to the inner surface of the membrane in the manner shown in Pl. XIV. figs. 4, 5, 6, 7, and 8. The attachment of the spores to pieces of the ruptured sporange is manifest in Pl. XIV. figs. 7 and 8. These spores vary very much in size and number in different sporanges. As many as fifteen may be counted inside the sporange, and occasionally only one, but sometimes two or three of much larger size are visible. The average size of the spores is about ·0001 inch in diameter, but they are frequently three times larger. They appear to be perfectly smooth when fresh; but when quite mature and dry they are seen, under a high power (such as $\frac{1}{16}$ inch), to be papillated. They swell considerably with the addition of moisture; but it is difficult to get them out of the sporange unless it has been reduced to a very dry condition, when a slight pressure will often rupture the membrane and detach the spores from its surface. Within each of these spores may be seen one or more semitransparent bodies or nuclei (Pl. XIV. figs. 4, 5, 6, 7, 8), and in some cases a nucleolus within the nucleus (figs. 5 and 6).

From the larger of the spores just mentioned there is reason to believe that a number, generally about ten, of minute ovoid bodies with a transparent nucleus, extremely like very small zoospores except that they possess no power of motion, are expelled. I have never observed these bodies actually issue from the large spore, but I have seen them attached to the ruptured membrane as if they had just been expelled.

Germination of the Spores.—The ordinary spores of the red sporange at times germinate readily; at others, although apparently quite fresh and healthy, not one of them will grow. Out of several packages of diseased leaves sent from Ceylon during 1877, not a spore would germinate, the reason for which I could never determine. Again, the spores from some of the spots on a diseased leaf will germinate, whilst from others they refuse. Whether this is due to conditions of growth or to the conditions to which they have been subjected after reaching maturity, I am unable to say; but I incline to the former view. Of the whole number of spores which I have tried to grow, only a very small fraction have ever shown signs of vitality.

If the sporange be placed in water or Pasteur's solution and kept at a permanent temperature of 90° F., the spores, if fertile, will begin to germinate in from forty to eighty hours after immersion, those which had been kept for sixteen months taking the longer period before mycelium appeared. Sometimes the germination takes place whilst the spores still remain within and attached to the sporange, as in fig. 9 (Pl. XIV.). At other times the spores escape and germinate in the neighbourhood of the sporange, fig. 10, Pl. XIV. The germination of the spore causes a bulging out of the membrane at one or two points; when there are two, they are generally directly opposite to each other. A portion of the contents of the spore enters this sac-like body, and a septum more or less distinct is immediately formed. The same process is repeated by the new cell, and a chain of cells is soon formed. During the process of germination the contents of the spore at times become almost transparent, or at least finely granular, and the nucleus and nucleoli appear to have been absorbed. Soon after germination the spore partially shrivels up, and its contents become more or less indistinct. Plate XIV. figs. 12 and 13 show some of the perfectly mature and dried spores in process of germination. Towards its extremities the mycelium assumes a more continuous form, and the septa are often scarcely discernible (Pl. XIV. fig. 14). The form of the cells varies very considerably: most frequently they are globose, obovate, or barrel-shaped; at other times they swell into irregularly shaped sacs, which become filled with granular protoplasm, with not infrequently one or more transparent globose bodies in them (Pl. XIV. fig. 15). At times the protoplasm within the cells remains almost perfectly transparent; but most frequently it assumes a distinctly granular character,

and after a time differentiates itself into one or more distinct bodies each containing a nucleus. This is distinctly seen in Pl. XIV. fig. 17. In specially vigorous specimens these bodies, at the end of sixteen or eighteen days, develop into bodies apparently exactly similar in character and size to the spores from the sporanges, the attachment of the spore being distinctly visible, as also are the semitransparent nuclei (Pl. XIV. fig. 18). Most frequently, however, the cells do not attain such a perfect development; but they burst, and the minute granular matter passes out without any further development into spores.

When the growing fungus is fed with boiled and filtered coffee-leaf juice, the granular protoplasm within the cells assumes a red tinge similar to that contained in the mycelium extracted from diseased coffee-leaves. The tendency of some of the cells of the mycelium, whether interstitial or terminal, to swell into a sac-like form is very marked. They attain at times to the size of three quarters of the red sporange, or about ·00075 inch in length and nearly the same in breadth. In one or two instances they have presented an appearance suggestive of conjugation; but at this point the growth of the fungus ceased, and I was not able to detect any actual communication between what appeared to be the antheridium and the oogonium*.

The conidioid form of fruit may very frequently be obtained by growing the mycelium on glass slides, the complete form being shown in Pl. XIV. figs. 19 and 20. These conidia are somewhat obovate and, when mature, papillated. Under a high power a fine connexion may be detected uniting together neighbouring conidia. In one instance (Pl. XIV. fig. 20) the terminal conidium was very much larger than the others, and remained perfectly smooth whilst they were papillated. These conidia are about ·00015 inch in length, and when placed in water germinate readily, producing a mycelium which is generally free from septa; but in some instances one or two septa are distinguishable (Pl. XIV. fig. 21). They also produce a second generation of conidia similar, but of inferior vitality, to the original ones.

With regard to zoospores, I have several times found them on the slips under circumstances that suggested a connexion with

* On this head consult the Rev. M. J. Berkeley's "Observations on a peculiar mode of Fructification in *Chironyphe Carterii*," Journ. Linn. Soc. vol. viii p. 139, tab. x. figs. 1–3.

the cellular mycelium or conidia of *Hemileia*; but I have never been able to determine whence they came.

Two points of difference between the Ceylon and the Sumatra forms of *Hemileia vastatrix* are noticeable:—(1) the transparent bodies, like barren cysts, which are found growing along with the sporanges in the Sumatra specimens, but which are never seen on those from Ceylon; (2) the greater tendency in the cells of the mycelium of the former to bulge out and form comparatively large ovoid masses. This is much less marked in the Ceylon specimens. In other respects, as far as I am able to judge, they are alike. It is believed that under somewhat different conditions the red sporanges are capable of giving rise to a different form of mycelium from that already described; but as the observations on this point were made with a low power, I have thought it best to omit noticing them here.

Conditions of Growth, &c.—With regard to the conditions of growth of *Hemileia vastatrix*, very many attempts have been made to infect growing coffee-plants, both through their young and their fully formed leaves. The same has been tried with coffee-leaves placed in an atmosphere saturated with moisture and kept at a constant temperature of 90° F.; but in no case has the attempt succeeded, although the sporanges, the growing mycelium, and the conidia have been placed on the leaves. What the necessary conditions are which are absent it is difficult to imagine, unless it be that the stomates, through which alone apparently the fungus finds its way into the leaf, are too contracted under the artificial conditions applied to allow the mycelium filaments or the spores to enter. The conidioid form of the fungus may readily be grown on the outside of the coffee-leaf in a moist atmosphere; but it does not appear to penetrate into the leaf; for in the case of such plants I have never seen either the mycelium within the tissues of the leaf or the clusters of red sporanges outside it. This latter form—the common one by which the "disease" is recognized in Ceylon—I believe to be the dry-weather form of the fruit, appearing generally in its greatest intensity soon after the rains have ceased, but very rarely during their prevalence. During the prolonged wet season the conidia have been found growing on many other plants as well as on the coffee-tree; but the mycelium remains on the outside, and the leaves show no traces of the disease. If it is necessary before

the fungus can infect the leaf that the stomates should be in a specially favourable condition for receiving the infection (a condition perhaps only occurring in certain states of the plant), this might be the reason why in the midst of such countless multitudes of spores every coffee-leaf is not covered with "disease" spots. On the other hand, it may be due to the fact that for some obscure reason only a very small proportion of the spores will germinate. It is also possible that my inability to grow the red sporanges is due to the fungus requiring some other tree or plant on which to develope before it is able to infect the coffee-leaf; but this is improbable.

In more than one district it has been noticed that a strong wind has apparently had a great effect in carrying the "disease" up or down a valley, most probably by spreading the spores from some badly infected estate over the comparatively healthy ones. If such is really the case, the fact points to the conveyance of the disease, as suggested before, to the tree through the stomates of the leaf and not through the roots. It might be possible under such conditions to moderate the virulence of the pest in some of the more isolated districts if all the proprietors *would combine to gather and burn, at the commencement of the chief annual attack, all the diseased leaves and twigs that at present are allowed to lie on the ground beneath the trees until they decay.* Such a plan would no doubt be expensive; but it would certainly destroy a vast number of spores, and might sensibly reduce the virulence of the "disease." The sprinkling of quick-lime on the ground beneath the trees has, in one instance at least, proved beneficial; and as it would no doubt destroy all the spores it came in contact with, it is not improbable that the two remedies, if applied simultaneously, might be found in some degree successful. The trees should also be washed with some suitable disinfectant, and the watering of the ground about the trees with the same disinfectant might possibly prove more beneficial than sprinkling with lime. It would be of little or no use for one planter in a district to attempt these remedies if the others did not—the spores produced on a single badly diseased tree being so enormously numerous, that a whole estate of healthy plants might easily be infected by a single unhealthy plant in their neighbourhood.

It has been asserted at various times that "native," *i. e.* unpruned and uncultivated coffee, as well as plants of the Liberian species, are exempt from the attacks of *Hemileia vastatrix*. This

is not the case. The former suffers to very nearly the same extent as the cultivated tree; whilst the latter showed that it was susceptible to the "disease" by being badly attacked within a few months after the first plants of the species were introduced into the island.

DESCRIPTION OF THE PLATES.

Plate XIII.

Fig. 1. "Disease" spot in process of development, the immature sporanges being orange-coloured, whilst the more mature are almost colourless; the dark spot in the centre is due to the presence of a black *aspergillus*; half natural size.

2. Portion of the cuticle of a diseased coffee-leaf, showing clusters of sporanges and stomates; × 150.

3. The same piece of cuticle, seen from the inside; × 150.

4. Cluster of sporanges with the dark mass that bears them and mycelium extricated from the leaf; × 200.

5, 6, 7. Mycelium from the interior of a "diseased" coffee-leaf; × 350.

8, 9. Cluster of sporanges from which all the more mature sporanges have been washed; × 400.

10. Cluster of sporanges from Sumatra, showing the barren cyst-like bodies amongst them; × 250.

11. The same as fig. 10, treated with potash and subjected to pressure; ×250.

12. Barren cyst detached by pressure.

Plate XIV.

Fig. 1, 2. Sporanges with portions of pedicel attached; × 800.

3. Sporange, showing the spores in its interior; × 800.

4, 5, 6. Spores detached by pressure from the sporange; × 1000.

7, 8. Spores attached to portions of ruptured sporanges; × 1000.

9. Spores germinating within the sporange; × 600.

10. Spores germinating within or near the sporange; × 600.

11, 12, 13. Somewhat immature and mature spores germinating; × 1000.

14, 15. Mycelium produced by germinating spores; × 500.

16. Mycelium with the commencement of the conidioid form of fruit; × 700.

17, 18. Well-grown mycelium, showing the spore-like bodies formed from the granular protoplasm within the segments. Fig. 17 × 700; fig. 18 × 1000.

19, 20. Conidioid forms of fruit. Fig. 19 × 500; fig. 20 × 1000.

21. Conidium germinating; × 1000.

Notes on Euphorbiaceæ.

By GEORGE BENTHAM, Esq., F.R.S., F.L.S.

[Read November 7, 1878.]

AMONG the large natural orders the elaboration of which I undertook for the 'Genera Plantarum,' I found the Euphorbiaceæ in almost as much confusion as to nomenclature and classification as the Compositæ, but for very different reasons. In the Compositæ, the great variety of forms indigenous to the civilized regions of the globe, enabling them to be readily observed in a living state by resident botanists, as well as the facility of preserving satisfactory specimens from other countries (which, even when very small, are often quite sufficient to exhibit their essential characters), have placed them at the mercy of a host of minor or special botanists, who have thought themselves justified in inundating the science with countless supposed new genera and species, the worthlessness of which they were incompetent to judge of. Euphorbiaceæ, on the contrary, of which so large a proportion are tropical, arborescent or frutescent, with the sexes separate, have been comparatively but little observed in a living state; and the herbarium specimens requiring to be large, judiciously selected, and carefully identified as to the two sexes, often so very different in inflorescence and perianth, are often far too imperfect for practical use, and but few botanists have found themselves in a position to deal with them. Two men, indeed, both of high standing in the science, and with comparatively ample materials at their command, have recently worked up the order with great care and attention independently of each other; and I would readily have followed the lead of either of them, but that the two have so frequently come to conclusions diametrically opposed to each other, that I have been compelled to steer a course of my own through a labyrinth of tribes, subtribes, genera, sections, or vaguely indicated affinities. As I should think it unfair to dissent from such men without stating in some measure the grounds of my dissent, and as the limits imposed on us would not allow of my doing so to a sufficient length in the 'Genera' itself, I have thought that the Linnean Society would permit my publishing the following notes in their 'Journal' as a complement to my former notes on Compositæ, Myrtaceæ, Campanulaceæ, and others.

These notes I have divided under the four heads of History,

Nomenclature, Systematic Arrangement, and Origin and Geographical Distribution.

I. HISTORY.

The Order may be said to have been established and defined by Robert Brown; but Adrien de Jussieu was the first to give any good general view of the characters and natural arrangement of the genera. His 'De Euphorbiacearum generibus Tentamen,' published in 1824, evinces that correct appreciation of affinities and clearness of method which distinguish all his monographs; but the materials at his command were then exceedingly limited, and, although several of his generic circumscriptions have been too much neglected, yet the enormous additions since made to the known species have really necessitated many important modifications of the system he proposed. After him Blume, in his 'Bijdragen,' a remarkable work, exhibiting singular accuracy of observation and judicious appreciation of genera considering the restricted resources at his disposal in a distant colony, described amongst others a considerable number of new forms of Euphorbiaceæ. Klotzsch, of Berlin, seeing a large number of new American ones in the collections received from Sello and others, bestowed much pains on their elaboration—but, unfortunately, occasioned some confusion in the great number of new genera he proposed, founded often on the examination of single species which at first sight presented some peculiarity in their aspect. His various papers, therefore, published chiefly in Wiegmann's (Erichson's) 'Archiv' and in the 'Monatsberichte' of the Berlin Academy, and detached descriptions in various works, have not contributed much to our general knowledge of the relations which the different Euphorbiaceæ bear to each other.

A number of detailed descriptions or cursory indications of new species dispersed through a great variety of works had further contributed to the difficulty of naming an Euphorbiacea, or of determining whether it was new or not, when Henri Baillon, working on the collections of various Parisian herbaria, undertook a comprehensive view of the genera. This he published in 1858 under the title of 'Étude générale du groupe des Euphorbiacées.' This work showed a great deal of careful research and accurate observation; but its practical utility was much marred by a want of method. It contains no well-defined tribes, nor, indeed, any divisions, except twelve series (of which no characters are given), and no conspectus or short diagnoses of the genera

to save the need of successively reading through on every occasion a number of detailed descriptions before you could determine a plant sufficiently to study it. And this defect was not remedied by the short heading prefixed to each genus, stating that it is some other genus with a difference. It is true that in some cases species have been generically separated from a previously known genus on account of some one specially exceptional character, and that it is useful to call attention to the fact that such is the only difference; but it is also true that most genera differ from every other one in several more or less prominent characters and are often equally allied to two or more; the selecting, therefore, one of them for comparison and indicating one point of difference, amounts practically to little more than a general proposition that *every* genus is *any* other one with a difference. On the other hand, the plates illustrating some of the most important characters of each genus are most useful, the analysis very accurate and well designed, the execution of the figures all that could be desired; one can only regret that they should have been inconveniently crowded in the plates without order, so that it takes occasionally some time to find out which of them belong to any one genus. The preliminary observations, occupying more than one third of the volume, contain much on structure and development, as well as on affinities and geographical distribution, well deserving of study, though one may perhaps not always agree with the author's conclusions. Dr. Baillon followed up this work by various papers in his 'Adansonia,' entering into specific details as to the Euphorbiaceæ of various collections, especially on African ones in the 1st and 2nd volumes (1860–61), New-Caledonian in the 2nd volume (1862), and American ones in the 4th and 5th volumes (1863–65).

In the meantime the advance of the 'Prodromus' required an immediate working up of the whole of the species of Euphorbiaceæ, amounting even then to nearly three thousand. M. De Candolle was fortunate in obtaining the services of Edmond Boissier for the vast genus *Euphorbia* itself, of which the head quarters may be said to be within the region of which M. Boissier had specially studied the flora. His excellent enumeration of above six hundred species was published in the second part of the fifteenth volume of the 'Prodromus' in 1862, and was liberally followed up by illustrations in 121 plates (published in 1866 under the title of 'Icones Euphorbiarum'). The elaboration of the great

bulk of the Order was undertaken by Jean Mueller of Argau, who had then the charge of De Candolle's herbarium. He devoted several years to this arduous task, visiting the herbaria of Paris and of Kew, and published the result as the chief portion of the same second part of the fifteenth volume of the 'Prodromus' in the year 1866. This work, as well as Baillon's, showed great pains taken throughout to ensure accuracy of observation; and if any defects are to be sought for, they are the very reverse of those observed in the case of Baillon. There is no want of divisions, subdivisions, and diagnostic conspectuses, but their practical utility is much marred by the strict adhesion to favourite characters, often exceedingly difficult to observe or even purely theoretical (as in the difference between suppressed and deficient petals), to the very general neglect of natural or geographical affinities. Geographical distribution may, indeed, have been rather more taken into consideration by Mueller than by Baillon; but both authors appear to have too frequently allowed natural affinities to be overruled by isolated characters to which the one or the other had attributed a constantly prominent value: as, for instance, where the one unites *Seidelia* with *Tragia*, far away from its closest allies *Adenocline* and other Mercuralioid genera; whilst the other removes *Calycopeplus* and *Anthostema* from *Euphorbia* to place them in a far distant series, the one between *Amperea* and *Cnesmone* in his *Jatropheæ*, the other next to *Dalembertia* at the end of his *Excœcarieæ*. Neither of these botanists appears to have borne sufficiently in mind the fact that characters differ in value in different genera or other groups, or even in the plants of different countries. No character, however important on some occasions, should be allowed to override all others on all occasions. The valvate male calyx, for instance, to which Mueller gives on most occasions so absolute a tribual value as to make the most unnatural combinations, is never allowed even generic value by Baillon, because of its inconstancy in *Croton*, whereas in many cases it certainly has no exceptions.

After the publication of the 'Prodromus,' Baillon severely criticised some parts of Mueller's system in a paper in the eleventh volume of 'Adansonia,' in which he also described several additional genera and species, chiefly from the New-Caledonian collections, then recently received at Paris. To these criticisms Mueller replied with some bitterness in the 'Botanische Zeitung' for the year 1873, p. 229. He also, in a folio volume, which is

one of the best of the splendid 'Flora Brasiliensis' inaugurated by Martius, described a large number of new Euphorbiaceæ, chiefly from the herbaria of Petersburg and Berlin, illustrating the Brazilian portion of the Order by 104 well-executed plates. Finally, the most recent review of the Order is Baillon's "Histoire des Euphorbiacées" in the fifth volume of his 'Histoire des Plantes.' This, however, is in great measure a compilation without much reexamination of specimens; for he has sometimes, it would appear, rather carelessly abandoned some of his former views to adopt those of Mueller, where his own may be the more correct; and the manner in which he has in other instances amalgamated genera which he as well as all others had previously maintained, is evidence of hasty conclusions much to be regretted. As for myself, in preparing the arrangement for our 'Genera Plantarum,' I have endeavoured to follow the lead of one or other of my predecessors, or of both when they appeared to be not too much opposed to natural affinities; but I have thought it right to take nothing for granted, and to examine for myself every genus, section, or apparently aberrant species of which specimens were available, reconciling as far as was in my power absolute characters with other evidences of natural consanguinity. In doing so, I freely submit my conclusions to the criticism of those who may follow me, admitting beforehand that some of my subdivisions are still much too technical, although I have failed in my endeavours to improve them. I have also to regret that so many Madagascar and New-Caledonian genera described from the Paris collections are out of my reach, being as yet unrepresented at Kew.

II. NOMENCLATURE.

The study of Euphorbiaceæ naturally suggests some considerations on botanical nomenclature, as it was that Order which was the occasion of the discussion of the subject previous to the establishment of the Candollean code. The extraordinary manner in which J. Mueller, in the 'Prodromus,' had appropriated to himself long-established names of genera or species if he only made the slightest change in their character or circumscription, the publishing as his own so many names that he found in widely distributed collections of specimens or in generally published catalogues, excited much comment on the part of botanists, and Alphonse De Candolle was induced to take up the question, and, after much deliberation and communication with the principal

botanists of the day, to frame a body of laws of nomenclature, which are generally excellent and would seem to have precluded all further discussion. The result has, however, not been quite effectual in checking the ever-increasing spread of confusion in synonymy. Besides the young liberal-minded botanists who scorn to submit to any rule but their own, there are others who differ materially in their interpretation of some of the laws, or who do not perceive that in following too strictly their letter instead of their spirit they are only adding needlessly to the general disorder. In the application as well as in the interpretation of these rules they do not sufficiently bear in mind two general principles:—first, that the object of the Linnean nomenclature is the ready identification of species, genera, or other groups for study or reference, not the glorification of botanists; and secondly, that changing an established name is very different from giving a name to a new plant.

Were every one agreed as to the plant to be designated by a particular name, the binomial appellations devised by Linnæus would be quite sufficient in all cases where a species is referred to for comparison, or is otherwise spoken of, as in catalogues, treatises, &c.; and even now the reference to *Helianthus annuus*, *Mathiola tristis*, &c. can lead to no mistake. But it so frequently happens that different authors have given the same name to different plants, that the addition of a third word (the abbreviated name of the author) has become indispensable in some instances, and advisable in most cases, to avoid uncertainty, but *for no other object*. Although much credit may be due to the collector or botanist who has discovered or distinguished really new species (and it is but fair that their discovery should be commemmorated), yet it is only second-rate botanists who pride themselves on the number of names, good or bad, to which their initials can be attached. In all cases, therefore, where the object is only to speak of a plant, as in catalogues, references, physiological treatises, or even local floras, for practical use one cannot attend too closely to the observations of De Candolle ('Lois,' p. 52; Engl. edit. p. 58) and say *Mathiola tristis* or *Mathiola tristis*, Br., without any addition (such as *Linn.*, *sub Hesperide*), explanatory of the history of the name. Such a history, absolutely necessary in a full monograph for instance, should always be considered as belonging to the description and history of the species, not as forming part of its name. It is also with sincere

regret that we see distinguished botanists endeavouring to combine rejected with adopted names by the obviously false nomenclature exemplified in *Mathiola tristis*, Linn.

The rule that long-established custom amounts to prescription, and may justify the maintenance of names which form exceptions to those laws which should be strictly adhered to in naming new plants, is unfortunately now frequently ignored; and the changes proposed in universally admitted names is producing in many instances the greatest confusion. The law of priority is an excellent one; and where a genus or species has been well defined by an early botanist in a generally accessible work, but has subsequently been neglected and the plant become known under other names, it is well that the original one should be restored. Thus in Laurineæ, the genus *Litsea* was very well characterized by Lamarck on a single species, and afterwards extended to five species in an excellent paper by the elder Jussieu in the 'Annales du Muséum,' which every monographist of the Order ought to have studied, but which was entirely neglected by Nees, and subsequently by Meissner, who, in the 'Prodromus,' followed Nees far too closely. Of seven names successively given to the genus, most of them founded on Lamarck's typical species, Nees chose Jacquin's *Tetranthera*, the most recent of all; the first one of the seven, *Glabraria*, Linn., was too vaguely and incorrectly characterized for identification; the second, *Tomex*, Thunb., was a preoccupied name; but there was no reason whatever for suppressing the third, Lamarck's *Litsea*, as extended by Jussieu, still less for transferring the latter name to a genus founded on one of Jussieu's species, but not his typical ones, and therefore not *Litsea*, Juss., as quoted by Nees. So, again, *Ocotea* of Aublet, whose mistake as to the fruit was corrected and the genus well characterized by Jussieu, should never have been replaced by the much later name *Oreodaphne* of Nees. In these cases one cannot refuse to restore the original names of Lamarck and Aublet. On the other hand, it creates nothing but confusion to suppress a generic name, well characterized and universally adopted by long custom, in favour of a long-forgotten one, vaguely designated in an obscure work, out of the reach of the great majority of botanists. It has been proposed, for instance, to replace the well-known *Chrozophora* of Necker and Adrien de Jussieu by *Tournesolia* of Scopoli, said to have been published in his 'Introduction,' a work to be found only in a very few continental libraries, not to my

knowledge in any English ones, and which I have never seen. Although this name may claim the right of priority and may have been correctly defined, yet it has not only become obsolete through general and long-continued neglect, but its composition is defective; for it appears to have been founded on the French popular name *Tournesol*, most generally applied to the sunflower (*Helianthus annuus*), and scarcely used for the *Chrozophora* except in the case of the "teinture de tournesol."

There are some generic names given by the earlier post-Linnean botanists and frequently neglected, about which there may be some doubt as to the propriety of their restoration. Aublet's names were generally altered by Schreber and by Necker, because they objected to their being founded on local appellations, an objection now considered mistaken, and Aublet's names have been properly revived; but with Loureiro's the case has been somewhat different. Loureiro had but few books to consult; his characters are often insufficient; he published no plates; and the few specimens preserved in the British Museum are sometimes incorrectly named. A considerable number of his genera are to this day absolute puzzles; others have been evidently mistaken, or their identification, arrived at through careful study, is attended with some uncertainty. They have therefore, until very recently, been usually neglected; and their present restoration is adding largely to an overloaded synonymy. And yet, where Loureiro's characters are unmistakable, one cannot absolutely object to the restoration of his names, however great the temporary inconvenience. It is hard to repudiate the well-known *Rottlera*; but Loureiro's *Mallotus* having been once substituted for it in the 'Prodromus,' we must submit, as it was originally well defined and there is no defect in its composition. There appears, however, to be no reason for replacing this again by *Echinus*, on the supposed ground of priority from being printed on a previous page of the same work. The whole work was published at the same time; and there is therefore no priority of one page over another. *Mallotus* was restored by Mueller before *Echinus* was taken up by Baillon, and therefore has so far the right of priority. *Mallotus* is correctly defined by Loureiro, which *Echinus* is not, if the two are really founded on the same species, as asserted by Mueller. This, however, is very doubtful. Loureiro was too much of a botanist to found two genera upon the same plant (except, perhaps, where he had failed to match the two sexes

of diœcious ones). The name *Echinus* is also to a certain degree defective, as being so very well known in the animal kingdom. It is true that, as urged by Baillon, a name having been already used in zoology is not a reason for changing it in botany; but the choice of such names should be avoided (Rules, art. 28 (10)), especially when they are truly classical names of animals, such as *Elephas* or *Echinus*.

The greater number of Necker's genera have been so imperfectly characterized with so absurd a terminology that they are quite indeterminable; and his names deserve to be absolutely ignored, except in the very few cases where Jussieu or other early French botanists have succeeded in identifying them, and corrected their characters; but even then it is doubtful whether these names should not bear the date of the correction rather than that of the original work. Adanson's 'Familles,' with all the inconveniences of its form and absurd orthography, is much more scientific, and many of his genera are well defined and have therefore been properly adopted; but still there are others far too vaguely described to warrant their being revived so as to replace generally adopted ones of a more recent date, as has been proposed, for instance, in the case of *Sporobolus* of Brown, which some botanists have replaced by the very uncertain *Vilfa* of Adanson (see Benth. Fl. Austral. vi. 620).

We have made it a rule in our 'Genera Plantarum' to yield no right of priority to ante-Linnean names, *i. e.* those published before the adoption of the Linnean system of nomenclature. If once we give this right to Tournefort or Rumphius, there is no reason for not going back to Bauhin or Clusius, or even to Pliny or Dioscorides, to the utter confusion of all synonymy. Linnæus, by the establishment of the binomial nomenclature, made an epoch in the study of systematic botany; and it is by far the most conducive to the facility of that study (the great object of nomenclature) to give up all search after previous names, and take all genera as adopted by him or satisfactorily modified by subsequent botanists. We therefore cannot, for instance, give Patrick Browne the precedence over Linnæus in the case of *Adelia*, as proposed by Mueller. Browne's first edition was ante-Linnean. He there gave the name of *Adelia*, not to a genus, but to a plant which afterwards entered into the genus to which Michaux gave the name of *Adelia*, but only after this name had been appropriated by Linnæus to a different genus; and I can see no

sufficient excuse for the great disturbance resulting from the replacing Linnæus's *Adelia* by the new name *Ricinella* in order to restore the post-Linnean name *Adelia* to the *Forestiera* of Poiret or *Adelia* of Michaux.

In taking up old forgotten names, monographists should be specially careful in ascertaining for themselves that they have been properly published and wrongly overlooked; for it is usual to rely on the accuracy of the bibliographical researches of monographists without repeating them for floras or other such works. The genus *Homalanthus* (*Omalanthus*), well characterized by Jussieu and figured in the 'Botanical Magazine,' was referred to *Carumbium* of Reinwardt by Miquel, who was blindly followed by Mueller; and I adopted the latter name in the 'Flora Australiensis,' having no reason to suppose that so careful a worker as J. Mueller, having such rich libraries at his disposal, had not ascertained for himself its right of priority. This turns out, however to have been a mistake of Miquel's. The reference given for the name is "Reinw. Hort. Buitenz. 108;" but Reinwardt published no catalogue of the garden of Buitenzorg. The work quoted under the above half-translated title is by Blume, in which the *Carumbium*, Reinw., is entered as a name only, without any character, and therefore is no publication of the genus, especially as the plant had been similarly entered by Noronha in a much earlier catalogue under the name of *Duania*. Reinwardt's *Carumbium* was first published as a genus in the 'Sylloge Plantarum' of the Ratisbon Society two years later than Jussieu's *Homalanthus*. Again, *Joannesia* of the Brazilian botanists (*Anda*, Juss.) is altered to *Johannesia*, under the supposition that Vellozo so spelt it in his 'Alografia,' where the genus was first published; but on turning to that work I find that Vellozo spelt it, like other Portuguese authors, *Joannesia*, as, indeed, was to be expected, as there is no *h* in the Portuguese name Joanna. So, also, *Galearia*, Zoll., is suppressed in favour of *Bennettia*, Br., because the date of the 'Plantæ Javanicæ rariores' is taken, not from the book itself, but from Pritzel's 'Thesaurus,' first edition, which only refers to the first part of the work; the last part, containing *Bennettia*, was only published several years after Pritzel's first edition. Roxburgh's *Gelonium* has been suppressed by Baillon in favour of *Suregada* of the same author, which, strictly speaking, has the right of priority, having been published by Willdenow in the 'Neue Schriften' of the Berlin Naturalists'

Society in 1803 as a manuscript name of Roxburgh's in Anderson's garden at Madras. But the name was never taken up by Roxburgh in any of his works, and was abandoned by Willdenow, probably on account of its being a local name of some uncertainty; Willdenow again published the genus in his 'Species Plantarum' under another manuscript name of Roxburgh's, *Gelonium*; and under this name Roxburgh entered the plant in his 'Hortus Bengalensis,' and Adrien de Jussieu in his 'Euphorbiacearum Tentamen.' The name has thus acquired the right of prescription, and is generally adopted by, I believe, all botanists except Baillon, who certainly was under some wrong impression regarding it; for in 'Adansonia,' i. 349, he quotes *Suregada bilocularis*, Roxb. Fl. Ind. iii. 829, which is the page where Roxburgh describes his genus *Gelonium*.

Much trouble has been practically given in the shape of useless additional synonyms, complication of indexes, &c., by alterations in the spelling of established generic names by way of correction. This has been chiefly done in two classes of cases:—first, where in dedicating a genus to a person the spelling of his name had been more or less altered; and secondly, where, in deriving a name from the Greek, the ordinary rules of etymology had not been followed.

The spelling of the names of persons is often complicated, especially when transferred from one language to another, or discordant with the principles of classical Latin orthography: therefore in latinizing them botanists of the last and even of the present century had thought that euphony required their modification, making *Gundelia* from Gundelsheimer, *Levenhookia* from Leewenhoeck, *Goodenia* from Goodenough, *Stranvæsia* from Strangways, *Andreoskia* from Andrzeiowsky, and numerous others. The names thus modified are just as fit to commemorate the persons to whom they are dedicated as if they were punctiliously exact but difficult or often impossible to pronounce properly in any language but their own. Individual letters represent a very different sound in different languages. The English double *o* makes two syllables in France and Germany; the Dutch double vowels have in other languages a very different effect from the legitimate one; the Polish *z* is either mute or, when in combination with other letters, represents our *h*; one Russian letter (the *ch* of *church*) can only be rendered by four letters in German, three in French, two in English, one in Italian, or one (a different one)

in Swedish; and therefore the Russian name is differently spelt according to which of these languages first presented it in a western form; another Russian letter is represented in German by seven, and when these are transferred to English they make a most barbarous compound. Where, therefore, the original author of a generic name dedicated to a person has thought it necessary in latinizing it to alter the spelling for the sake of euphony, I can see no reason why the form thus given to it should not be strictly adhered to without attempting to correct it.

With regard to names derived from the Greek, Labillardière and several other botanists of his day, being no Greek scholars, allowed themselves great latitude in the formation of such names, ignoring the classical Latin equivalents of Greek letters, placing the adjective portion of the name after instead of before the substantive part, &c.; and sometimes the vicious structure of the names is so glaring that one cannot refuse to correct them; but then great care should be taken to ascertain that the original names were really wrong. As examples of uncalled-for corrections, take *Argithamnia*, Swartz, which has been altered to *Argyrothamnia* on the supposition that the first part was derived from *ἀργυρος, silver*, whereas Swartz expressly states that it is from *ἀργος* (often written *ἀργιος*), *white*. Again, Aublet's *Roupala* has been changed into *Rhopala*, as being derived from *ῥοπαλον, a club*; but for this there is no foundation. Aublet knew nothing of the Greek language, and did not care to have recourse to it for his generic names, which he preferred taking from local appellations. The genus has nothing club-shaped about it; and there is every reason to suppose that in naming it Aublet followed his usual practice. So, also, *Thuarea*, Pers., has been altered to *Thouarea*, as having been named after Thouars, which is not the case. Thouars himself sent the plant to Persoon with the manuscript name of *Microthuarea*, shortened by Persoon (as he did with other over-long names) to *Thuarea*, but afterwards published at full length by the original author, with the explanation that it is derived from *μικρος, small*, and *θυαρος*, one of the names of *Lolium* (see Hedericus): a correction, therefore, to *Thyarea* might have been plausible, though unnecessary; but *Thouarea* is quite out of the question. It is true that, with the addition of *micro*, one cannot help thinking that the author intended some allusion to his own name (Du Petit Thouars); but as he gives another interpretation we are bound, by accepting it, not to charge

him with this piece of vanity. It is probably by a slip of the pen that *Chrozophora*, Neck., has become altered into *Crozophora*, though it is expressly derived from χρωσις, *tinctura* or *coloratio*, and φορος, *ferens*. There is no Greek word from which *Crozo* could be derived.

The representing the Greek aspirate by an *h* was generally neglected by early botanists, but now, ever since De Candolle altered *Elichrysum* into *Helichrysum*, modern purists have insisted upon inserting the *h* in all cases; and this has been so far acquiesced in that it is difficult now to object to it, though it has the effect of removing so many generic names to a distant part of all indexes, alphabetical catalogues, &c. Admitting the propriety of adding the aspirate in new names, I had long declined to alter old names on this account; now, however, I find myself compelled to follow the current.

The question of specific nomenclature is not directly connected with a 'Genera Plantarum;' but there is one practice which has grown up of late years, adding largely to the number of useless synonyms, against which I cannot refrain from taking this opportunity of entering a strong protest. I mean that of creating a new name in order to combine an old specific with a new generic one. In ferns, the wanton multiplication of ill-defined or undefinable genera, according to the varied fancies of special botanists, has had the effect of placing the same species successively in several, sometimes seven or eight, different genera; and it is proposed to maintain for the specific appellation the right of priority, not in the genus alone in which it is placed, but in the whole of the genera to which, rightly or wrongly, it has been referred. This has been carried to such a degree as to give to the specific name a general substantive aspect, as if the generic ones were mere adjuncts—a serious encroachment on the beautiful simplicity of the Linnean nomenclature; and it is to be feared that there is a tendency in that direction in phænogamic botany. When a botanist dismembers an old genus, rule 57 requires that he should strictly preserve the old specific names in his new genera; and when he has wantonly and knowingly neglected this rule it may be right to correct him. But where a botanist has established what he believes to be a new species, and has therefore given it a new name, the changing this name after it has got into general circulation, because it has been discovered that some other botanist had previously published it in a wrong genus, is only adding a synonym without any advantage whatever, and

is not even restoring an old name; for the specific adjective is not of itself the name of a plant. Ask a seedsman for some *Canariensis* and he will probably give you *Tropæolum peregrinum*, not *Phalaris canariensis.* A generic name is sufficiently indicated by one substantive, for no two genera in the vegetable kingdom are allowed to have the same name; but for a species the combination of the substantive and adjective is absolutely necessary, the two-worded specific name is one and indivisible; and the combining the substantive of one name with the adjective of another is not preserving either of them, but creates an absolutely new name, which ought not to stand unless the previous ones were vicious in themselves, or preoccupied, or referred to a wrong genus. It is probably from not perceiving the difference between making and changing a name that the practice objected to has been adopted by some of the first among recent botanists, such as Weddell, though under protest (see the note in DC. Prod. xvii. 1. 73). To give a couple of instances among hundreds that have lately presented themselves to me: Wight published a Nilgherry plant which he believed to be new, and was certainly a new genus, under the name of *Chamabainia cuspidata,* in all respects a legitimate name; and he could not be expected to identify it with *Urtica squamigera* of Wallich's 'Catalogue,' as the plant is not an *Urtica.* Wight's name was therefore adopted in Weddell's excellent monograph; but in the 'Prodromus' he thought himself obliged, in spite of his better sense, to call it *Chamabainia squamigera,* which is neither Wallich's faulty name nor Wight's correct one, but an entirely new name, to be rejected by the law of priority, which requires the adoption of the oldest correct name. So, again, an Indian grass was first named and described by Willdenow as *Coix arundinacea,* then named in the 'Hortus Benghalensis' and distributed by Roxburgh as *Coix barbata,* and entered in Sprengel's 'Systema' with Willdenow's character as *Coix Kœnigii.* All these names were defective as referring to a wrong genus. Brown corrected the error by creating the new genus *Chionachne,* and selected Roxburgh's specific name as the one most generally known and the least liable to misinterpretation; and Brown's *Chionachne barbata* is therefore the *first correct* name, for which Thwaites afterwards substituted *Chionachne Kœnigii,* an entirely new and useless name, which falls by the law of priority. It should be well borne in mind that every new name coined for an old plant, without affording any aid to science, is only an additional impediment

III. SYSTEMATIC ARRANGEMENT.

The general affinities of the Order have been repeatedly discussed. Euphorbiaceæ have been severally compared with Malvaceæ, Sterculiaceæ (especially Buettnerieæ), Rutaceæ, Rhamneæ, Celastrineæ, Chailletiaceæ, and even Menispermeæ, among Polypetalæ, and with Urticeæ and a few others among Monochlamydeæ. But though there are individual genera which may exhibit some one character supposed to be nearly peculiar to some of those orders, yet no real connexion has as yet been pointed out. The isolation to which I shall further on have occasion to allude, is produced not so much by any one special character as by a special combination of several. And if a few genera may have been bandied about between Euphorbiaceæ and other orders on account of the supposed identity of some one of these characters, it will be found to be owing to their having been imperfectly known from specimens of one sex only, or otherwise defective, so as not to show how that character was connected with all others.

But if it be admitted that Euphorbiaceæ constitute an isolated group, nearly equally surrounded by several others, there remains the question (which it is necessary to decide) Where should they be placed in the linear series which, though not in Nature, we are compelled to adopt? In the Candollean arrangement (which, with all its defects, we have followed in our 'Genera Plantarum' for want of a better one) they come under Monochlamydeæ. As, however, a considerable number of the genera have petals, they have supplied one of the principal grounds for the often proposed breaking up of the class of Monochlamydeæ and distributing their orders amongst Polypetalæ; but even then the most eminent of the botanists who have attempted to do so are not at all agreed as to where Euphorbiaceæ should be placed in that class. Some would bring them near to Rhamneæ and Celastrineæ, to which many Phyllantheæ and Galearieæ indicate an approach; others rely upon the petaliferous Crotoneæ as showing an affinity with the Malval alliance. In either case their practical insertion among Polypetalæ has generally been between orders more nearly allied to each other than to Euphorbiaceæ; and many of the petalless Crotoneæ, especially Hippomaneæ, appear to me to show quite as near an approach to Urticeæ as do the Phyllantheæ to Rhamneæ. As, therefore, the order cannot be broken up, its old place among Monochlamydeæ seems to be the best suited to

the present state of our knowledge of the vegetable kingdom, occasioning the least break in the regular series. It will be observed also that about three fourths of the genera and nearly three fourths of the species are entirely without petals; and, of the petaliferous genera, many have them only in the male flowers, or have only small scales alternating with the stamens, which are perhaps not always true petals. The approximation, moreover, of Euphorbiaceæ to Urticeæ has been well exhibited by Weddel in the introductory part of his excellent monograph of Urticeæ, but as an approximation only. He regards Euphorbiaceæ as bearing the same relation to Malvaceæ that Urticeæ do to Tiliaceæ.

In the limits of the order which we have adopted as those which in the course of Nature appear to have become affixed to it, we have followed Mueller and Baillon in including Antidesmeæ and Scepaceæ; but we cannot agree to the exclusion of *Daphniphyllum*, *Buxus* and its allies, *Styloceras* and *Simmondsia*, upon single characters to which ordinal importance has been given, though unaccompanied by any other one; neither can we admit into the order, as proposed by Baillon, the Chailletiaceæ, with their usually hermaphrodite flowers, besides other minor differential characters. So also the anomalous genus *Callitriche*, considered by Baillon as a tribe of Euphorbiaceæ, appears to us to have neither the characters of the order nor the habit of any of its genera, even though it may not be really a reduced form of Halorageæ, where we had placed it in the 'Genera Plantarum.'

In our general arrangement of the order we have chiefly followed Mueller, consolidating, however, or lowering the grade of those groups which are technically founded on the æstivation of the calyx or the form of the anthers, and dividing the whole order, including the Buxeæ, into six tribes. Of these the first three, chiefly extratropical, are each one distinguished chiefly by some one abnormal character, more or less confirmed, however, by accessory ones—*Euphorbieæ* by the calyx-like involucre, *Stenolobeæ* by the narrow cotyledons, and *Buxeæ* by the peculiar position of the ovules. The great mass of tropical genera form two great tribes:—*Phyllantheæ*, with the outer stamens, when isomerous, opposite the sepals, and with two ovules to each cell of the ovary; and *Crotoneæ*, with the outer stamens, when isomerous, alternate with the sepals or opposite the petals, and only one ovule to each cell of the ovary. A few genera with the oppositisepalous

stamens of Phyllantheæ, but with the uniovulate cells of Crotoneæ, are collected in the small intermediate tribe, *Galearieæ.* These tribes are not, however, strictly geographical; for the extratropical ones comprise a few tropical species, and *vice versâ* a few extratropical species, or even small genera, must be included in the tropical tribes; and the difference between the two great tropical tribes, in those genera where the stamens are very numerous and crowded in the centre of the receptacle, must rely mainly on the number of ovules in the females.

I propose considering these tribes, with some remarks on a few of the genera in the order in which we have placed them for our 'Genera Plantarum.'

1. Euphorbieæ.

This tribe—in which the androgynous cymule, consisting of one central female flower surrounded by several monandrous males, all without perianths or very rudimentary ones, is enclosed in an involucre formed by the union of several bracts usually bearing external glands—was first marked out by Adrien de Jussieu, who, however, relying mainly on the presence of an involucre, included *Dalechampia.* That genus, with a very different inflorescence within the involucre, has been properly rejected from the tribe, which, with this exception, has been generally adopted by subsequent botanists. Baillon, it is true, recurring to the old idea, that the involucrate cymule of *Euphorbia* was a single hermaphrodite flower, has taken that as the character of the tribe, and rejected far away *Calycopeplus* and *Anthostema,* in which even he could not maintain the hermaphroditism. Baillon's arguments, however, have been refuted by several observers who have taken up the question after him, as well summed up by the most recent, Eichler, in his 'Blüthendiagramme,' ii. 386; and I am not aware that Baillon has found any one to support him.

The genus *Euphorbia,* with its six hundred and odd species, forms the chief part of the tribe, and is exceedingly varied in habit and primary inflorescence, but so uniform in the arrangement of the cymule and structure of the flower, that its division into good sections is a matter of the greatest difficulty. Boissier, who has most carefully worked it up for the 'Prodromus,' divides it into twenty-six sections, many of them good, but very unequal in systematic value and number of species. They would appear to me to be more practically useful, and at least as systematically

correct, if grouped into about six principal ones, very fairly characterized as to the great majority of species, but all more or less confluent through intermediate ones. These are:—1. *Anisophyllum*, usually prostrate, much-branched herbs from most parts of the globe, with all the leaves opposite and stipulate, and the glands of the involucre almost always furnished with petal-like appendages; 2. *Adenopetalum*, American species with the petal-like appendages of *Anisophyllum*, but with a varying habit, the stem-leaves below the branches alternate except in two or three species, the stipules usually replaced by small glands or deficient; and four sections without the petal-like appendages:—3. *Poinsettia*, American species distinguished by the coloured bracts below the involucres, and by a greater or lesser obliquity in the involucres, showing an approach to *Pedilanthus*; 4. *Eremophyton*, distinguished from *Tithymalus* by the usually dichotomous not umbellate inflorescence; 5. *Euphorbium*, by the thick and succulent or rarely slender stem and branches, almost or quite without leaves; and 6. *Tithymalus*, with all or most of the primary branches forming a terminal umbel, the leaves of the main stem always alternate, without stipules. Of these six sections, *Anisophyllum* and *Tithymalus*, and sometimes even *Poinsettia*, are by some botanists considered distinct genera, but with characters derived solely from habit, and not definite enough for generic separation. All attempts to take into account minor modifications of inflorescence, the form of the glands of the involucre, the degree of union of the styles or their branches, &c., have only resulted in isolating single species or collecting several together which bear evidently but little general affinity to each other. Many of Boissier's sections therefore, however useful in practice, can scarcely take rank but as artificial divisions of the above six.

Of the other genera composing the tribe, *Pedilanthus* is an American aberration, with a marked irregularity of the involucre, giving it so peculiar an aspect that the genus has been universally adopted, although a few of its fifteen supposed species come very near to such of the *Poinsettia* section as have a decidedly oblique involucre. On the other hand, *Synadenium*, *Anthostema*, and *Calycopeplus* are three genera of two or three species each, two of them African, the third Australian, which afford some assistance in the explanation of the floral arrangement, and in some measure connecting the tribe with some genera of Crotoneæ

(Hippomaneæ). In aid of this explanation various published diagrams may be referred to, especially the plan given by Baillon, 'Histoire des Plantes,' v. 105, f. 145, noting, however, that it is purely diagrammatic, not the plan of any particular species, and that many *Euphorbia*-flowers may be examined without detecting the arrangement, whilst in others one or another part of it may be very evident. It will be seen that the cymule consists of a single terminal female flower surrounded by a number of males arranged in four or five clusters, in two rows in each cluster, these clusters representing the primary branches of the cymule; and each of these primary branches or clusters is subtended by a bract—the four or five bracts united in an involucre, almost to the top in *Euphorbia*, not so high in one species of *Synadenium*, not up to the middle in *Calycopeplus*, and shortly and irregularly in *Anthostema*. Outside the involucre are usually prominent glands, corresponding to those observed at the base of the bracts on each side in many Hippomaneæ. These glands are similarly lateral and almost basal in *Anthostema*, though irregular and here and there deficient. In *Synadenium* all those of the five bracts are united in a single continuous ring round the base of the involucre. In most *Euphorbiæ* the two contiguous ones of adjoining bracts are united into single, often two-lobed glands, alternating with the lobes of the involucre. In a few species of the section *Poinsettia*, and still more so in *Pedilanthus*, the glands become very irregular, usually deficient on one side of the involucre. In *Calycopeplus* the glands are very small or entirely disappear. Inside the involucre, besides the flowers, there are in most species of *Euphorbia* a number of narrow or hair-like scales mixed in with the male flowers, or crowded between the clusters, as represented in Baillon's diagram. These appear to be in exact correspondence with the bracteoles subtending the male flowers in many Euphorbiaceæ; the lower ones (those next the centre of the cymule) are often more or less united at the base, especially when empty, prominently united in a few species, as represented in *E. cæcorum* and *E. insulana* in the 'Flora Brasiliensis.' In *Calycopeplus*, *Anthostema*, and *Synadenium* these outer bracteoles are united in as many broad bracts as there are clusters, each completely enclosing the cluster; and in *Synadenium* the five are more or less united at the back into a tube surrounding the pedicel of the female flower. In Baillon's view of the supposed flower these bracteoles would be quite unintelligible.

2. Stenolobeæ.

This small tribe was established by Mueller in the 'Prodromus,' but absolutely rejected by Baillon, chiefly because it rests on a character which can rarely be observed, and is therefore perhaps not constant, and which is combined both with uniovulate and with biovulate cells of the ovary, a difference considered of primary importance in separating tribes. This main character of Stenolobeæ, the linear embryo with narrow cotyledons, is an essential, not an adaptive one likely to be affected by external influences of soil, climate, or social conditions; and it is strictly geographical (southern, extratropical, and almost exclusively Australian), thus giving strong evidence of the natural affinity (consanguinity) of the genera in which it is developed. Its supposed constancy has, moreover, been more and more confirmed as observation has extended. I have myself examined the seeds of the great majority of the genera of Euphorbiaceæ, and we know the structure of others from reliable observations of other botanists; and although there may be in other tribes a few embryos exceptionally small in comparison with the albumen, or with exceptionally large and fleshy cotyledons, yet there are none assuming the peculiar form of the Stenolobeæ. Even in the nearest approach to it, in two or three species of the South-African *Adenocline* and *Seidelia*, the cotyledons are still flat and nearly twice as broad as the radicle, whilst in Stenolobeæ I have never found them half as broad again as the radicle. If in *Buxus* and *Daphniphyllum* the cotyledons are narrow, still the general form of the embryo is very different from that of the Stenolobeæ. We have therefore maintained Mueller's primary series Stenolobeæ as one of our principal tribes, as detailed in my 'Flora Australiensis,' to which I would refer for further particulars as to the genera. We have, however, added to the tribe one plant which, though not Australian, belongs to that South-Andine region which, in many other instances, shows a connexion with the Australian flora. This is the *Dysopsis*, Baill. (*Molina*, C. Gay), from Chili and Juan Fernandez, which has so little apparent affinity with the Crotoneæ, to which it had been technically referred, that it has been conjecturally named as belonging to very different orders, and even figured as a *Hydrocotyle*. It has, however, precisely the embryo, as well as other characters, of Stenolobeæ, though even there it constitutes a genus not closely allied to any other one.

3. Buxeæ.

Buxus had always been regarded, as it still is by most botanists, as a genus of biovulate Euphorbiaceæ, until Baillon observed that the position of the ovules was somewhat different from that in the other genera. The two ovules of each cell are separately affixed to the dissepiments, one on each side of, and at some distance from, the central angle, with the raphe more or less dorsal, and the micropyle turned towards the dissepiment or towards the central axis; whilst in the generality of Euphorbiaceæ the two ovules are affixed close together in the angle of the cell, and often under one common obturator, and the micropyle is external. He therefore proposed raising the genus to the rank of a distinct order, adding to it the closely allied genera *Pachysandra* and *Sarcococca*; and in a detailed monograph of the new order he summed up (p. 5) the several characters of *Buxus*, "qui ne se rapportent aucunement aux plantes de l'Ordre des Euphorbiacées," under the following seven heads:—

1. Opposite leaves—which are not in *Pachysandra* or *Sarcococca*, and are now known as characteristic of at least a dozen genera of true Euphorbiaceæ.

2. Absence of milky juice. This milky juice, though generally prevalent, is far from being universal in Euphorbiaceæ.

3. Styles distant from each other at the base, leaving the summit of the ovary bare between them. In *Buxus subcolumnaris*, and most if not all species of *Sarcococca*, however, the styles are not only close together, but shortly united at the base.

4 and 5. The above-mentioned position of the ovules—which appears to be the only constant character of the group.

6. The micropylar strophiole replaced by a fleshy production of the hilum. Baillon himself has described a similar production in some other genera; and in many cases the origin of the appendage at or near the insertion of the seed has not yet been satisfactorily traced.

7. The loculicidal dehiscence of the capsule. But *Sarcococca*, and apparently one species of *Pachysandra*, have an indehiscent drupe; and loculicidally dehiscent capsules occur in several tribes or subtribes of Euphorbiaceæ.

To the above three genera Baillon added Kunth's *Styloceras*, as a separate division of the proposed order, differing from the typical one in the number, form, and insertion of the stamens,

and in the division of the ovary-cells into two compartments by the protrusion of a spurious dissepiment between the two ovules, a character unique in Euphorbiaceæ. Two species have the distant styles common in *Buxus*; in a third (*S. columnaris*, Muell. Arg.) they are close together and united at the base. Mueller, in the 'Prodromus' (xvi. 1. 7), adopts Baillon's Buxaceæ as a distinct order, which however he leaves in close proximity to Euphorbiaceæ; and he adds to it the Californian *Simmondsia*, notwithstanding the uniovulate cells of the ovary. Baillon, again ('Histoire des Plantes,' vi. 47), agrees to the admission of *Simmondsia*, but places the whole group in Celastrineæ, according to peculiar views which I feel quite incompetent to understand. To me it appears that Buxeæ, thus extended, constitute a marked and well-defined though very heteromorphous group, but not of a higher grade than that of a tribe of Euphorbiaceæ, allowing, as in Stenolobeæ, a specially exceptional essential character to override that derived from the uni- or biovulate cells of the ovary.

4. Phyllantheæ.

The division of the great mass of tropical Euphorbiaceæ into great groups according as the ovary-cells have one or two ovules in each, originally sketched out by Adrien de Jussieu, and almost universally adopted, is very near being a natural one. The inflorescence of the biovulate *Phyllantheæ*, always axillary, is, in the typical genera, usually in sessile clusters or cymules, at least in the males; the calyx is rarely valvate, and occasionally distinctly 2-seriate, the sepals of the two series sometimes dissimilar; the petals, in the few genera where they are present, are usually small and scale-like, not always readily distinguishable from lobes of the disk; and the stamens, rarely more than twice the number of sepals and mostly isomerous with them, have the single or outer series opposite the sepals. In the uniovulate *Crotoneæ* the inflorescence is usually spicate, racemose, or paniculate, and in several genera terminal; the male calyx is uniseriate and often valvate; the petals, when present, are quite corolline in their aspect and insertion; and the stamens are often indefinitely crowded in the centre of the flower—but when definite, those of the single or the outer series are alternate with the sepals. In the fruit, however, both these great tribes vary in the same manner; and the concordance of the above characters is by no means constant. The latter groups of our series of Phyllan-

theæ have the inflorescence of many Crotoneæ, and a very few Crotoneæ have the typical inflorescence of Phyllantheæ. The calyx is valvate in two or perhaps three genera of Phyllantheæ; the petals are fully developed in a few species; and a few genera have the indefinite central stamens characteristic of so many Crotoneæ. There are also a few genera with the uniovulate cells of Crotoneæ, which have nevertheless the outer or single series of stamens opposite the sepals, as in Phyllantheæ. In order not to invalidate the characters of the two great tribes, I have collected these last exceptional genera into a small intermediate tribe, the *Galearieæ*. The main character also, the difference between the uniovulate and biovulate cells, is in a few cases not quite certain. There are some biovulate genera where one only of the two ovules is fertilized, and as the ovary becomes enlarged after flowering (the state in which it is usually examined) the unimpregnated ovule remains exceedingly small and has often been overlooked. The three tribes must therefore be regarded as to a certain degree artificial, and may hereafter be proved to be more so, and made to give way to a better arrangement; but in the present state of our knowledge they appear to form the most useful, as well as the most generally received primary division of this part of the order. The subdivisions of the two great tribes may be more natural; but those at least of the Phyllantheæ, which I propose first to consider, are as yet too indefinite to be classed as distinct subtribes.

Taking, first, the petaliferous genera with a normal Phyllanthous inflorescence and uniseriate stamens, we have a group of six or seven, remarkable for their large fleshy cotyledons, with the albumen reduced almost to a membrane, or entirely deficient. All have also the rudimentary pistil well developed in the male flowers, a character brought prominently forward by Adrien de Jussieu, and recently by Mueller, and very constant in many instances, though not always to be relied on. Two of these genera, *Bridelia* with about 25 species, and *Cleistanthus* with about 22, all from the Old World, have been removed by Mueller to a distant subtribe, on account of their valvate calyx; whilst Baillon, making little account of that character, unites them as sections with the American and West-African genus *Amanoa*. It cannot be denied that there is close affinity between the three; but the characters which separate them are constant and definite, and appear fully to warrant their main-

tenance as distinct genera, though we would place them in close proximity. *Bridelia* is, morever, distinguished by the succulent indehiscent fruit, which in the other two is the ordinary tricoccous capsule. This genus shows also that the general character of the group is not to be absolutely relied upon; for in a few species the seed is albuminous with thin flat cotyledons, whilst in others it is precisely that of *Cleistanthus*, exalbuminous, with fleshy cotyledons. A third genus with valvate calyx, *Stenonia*, consists of a single Madagascar species which I have not seen, and of which the fruit is unknown, and therefore somewhat doubtful as to its position. The four remaining genera of the group, with imbricate sepals, are well characterized and generally adopted, and call for no special remark. They are:—*Amanoa*, with 6 tropical species from Eastern America and Western Africa; *Discocarpus*, 3 species from east tropical America; *Lachnostylis*, a single South-African species with the characters almost of *Discocarpus*, including the curious broad contortuplicate cotyledons, but yet with sufficient to keep it distinct, especially considering its geographical position; and *Actephila*, with 10 species from tropical Asia and Australia. One of these, included by Mueller in *Lithoxylon*, is correctly referred by Baillon to *Actephila*; the typical *Lithoxylon*, once raised in our gardens from Taitian seeds, remains very doubtful as to its affinities. It is only known from Lindley's figure and description, and from a very imperfect specimen; the fruit has never been observed.

There remain three petaliferous genera, *Wielandia*, *Savia*, and *Andrachne*, which, notwithstanding that character, appear to be best classed with the typical apetalous Phyllantheæ, of which they have the inflorescence, the fruit, and other characters. All three have the rudimentary pistil well developed in the male flowers, as in the other petaliferous genera; but that occurs also in the apetalous genera *Securinega* and *Fluggea*. In *Andrachne* and the West-Indian *Saviæ* the petals are very small and scale-like, as in our first group of Phyllantheæ. In the Madagascar species of *Savia*, and in *Wielandia* from the Seychelles, they are as well developed as in the petaliferous Crotoneæ; these Mascarene plants are but imperfectly known to me from defective specimens; but they do not appear to be otherwise distinguishable from the group. *Wielandia* is reduced by Mueller to a section of *Savia*; but the characters given by Baillon, as well as the habit of the

plant, appear to us to be such as to warrant the following him in retaining it as a distinct genus. Another petaliferous genus, *Gonatogyne*, Klotzsch, has been published by Mueller in the 'Flora Brasiliensis' from imperfect specimens gathered by Sello in South Brazil. Baillon refers it to *Amanoa*, of which, however, it has neither the fruit nor the habit; it is probably more nearly allied to *Savia clusiæfolia*, Griseb., but must remain for the present of very doubtful affinity.

The typical apetalous Phyllantheæ have sessile or pedicellate flowers in sessile axillary clusters, or the females solitary on longer pedicels, the calyx imbricate, the stamens uniseriate opposite the sepals, the styles erect or recurved, linear or slender, simple or bifid, or dilated into flat stigmas at the end only; the fruit capsular, separating into two-valved cocci, or baccate and three-celled; the seeds with copious albumen and broad, flat, thin, cotyledons,—the chief exceptions to these characters being in solitary or very few species of *Phyllanthus* itself.

We commence with three small Old-World tropical genera, *Agyneia*, *Sauropus*, and *Cluytiandra*, which have all the habit of many species of *Phyllanthus*, but are distinguished chiefly by a fleshy, often scale-like thickening of the base or centre of each of the sepals, described by Mueller as so many lobes or glands of the disk. In this view I cannot well concur; for they are removed from the receptacle, a considerable interval occurring between them and the stamens in some species; in other species they are concave, almost enclosing the stamens before the flower expands. Mueller, moreover, regarding these scales as disk-glands, and observing them to be opposed to the stamens, not alternate with them, as in the case of true glands or lobes of the disk, supposes them to indicate that the petals are not organically absent, but constantly suppressed. He accordingly removes these genera from their natural allies to place them amongst petaliferous ones; and Baillon even unites *Cluytiandra* with *Andrachne*. To my mind it is clear that their proper place is next to *Phyllanthus*, and that *Cluytiandra*, quite distinct from *Andrachne*, is scarcely separable from *Sauropus*. The rudimentary pistil in the male flowers, deficient in *Agyneia* and *Sauropus*, is described by Mueller as terminating the staminal column in *Cluytiandra*; it is in our specimens but very small and obscure, and scarcely of generic importance.

Of the main genus *Phyllanthus* Mueller has described, in the

'Prodromus' or in the 'Flora Brasiliensis,' nearly 450 species, almost all tropical, extending into more temperate regions only in the southern hemisphere or in North America. Unlike the other two great Euphorbiaceous genera (*Euphorbia* and *Croton*), *Phyllanthus* abounds in differences, not only in habit but in staminal, pistillous, and other characters, which have appeared to various botanists essential enough to induce them to propose the establishment of no less than thirty distinct genera. Unfortunately the most striking of these characters often widely separate species which most closely resemble each other in other respects; and the whole are now reunited by Mueller into a single genus. Among them are a few for the maintenance of which fair grounds might be adduced, especially *Glochidion*, and perhaps *Synostemon* and *Cicca*; but as Mueller has described the whole in detail as species of *Phyllanthus*, and as Baillon has adopted his views, it would only produce confusion now to rename so large a number of species, unless on reviewing them in detail for the 'Flora Indica' their separation should prove to have preponderating advantages.

Mueller divides the genus thus consolidated into forty-six sections, which, barring here and there a single exceptional species, might be fairly grouped into eleven primary sections. Of these, two (both well characterized and almost of generic value) are distinguished from almost all other species by having no interstaminal glands or hypogynous disk, viz.:—1. *Glochidion*, about 130 trees or shrubs with coriaceous leaves, from the tropical regions of the Old World, many of the species very much involved, and requiring a careful study by Indian botanists; and 2. *Synostemon*, containing 14 species, all limited to Australia. Three more sections have the disk more or less developed, and the capsule more or less fleshy or succulent, though ultimately normally separating into cocci, viz.:—3. *Cicca*, about half a dozen arborescent or shrubby species, either American or from the Old World, with the male flower usually 4-merous; 4. *Kirganelia*, a small number of Old-World shrubs, with the male flower usually 5-merous; and 5. *Emblica*, a single Asiatic species, with a peculiar habit, and usually only three stamens. Mueller has added to the latter section several species of various habit, with the styles as in the true *Emblica*, more or less united in a column, and spreading only at the top—but which, on account of the dry capsule and other characters, might be better classed under *Paraphyllanthus*. The remaining six sections have the disk developed

and the capsule dry, and a considerable number of the species are herbaceous, or even annuals, though some are shrubby, but scarcely arborescent. These are:—6. *Emblicastrum*, a single species from the Malayan Archipelago, with the habit of *Emblica*, but differing from the whole genus in the female inflorescence and flower. 7. *Williamia*, three Cuban species, remarkable for the stamens twice or thrice the number of sepals, and arranged in two or three series. 8 and 9. *Paraphyllanthus* and *Euphyllanthus*, comprising together nearly 200 species dispersed over the whole area of the genus, two or three of them almost cosmopolitan weeds; both the sections usually, but not always, 3-androus, with precisely similar variations in habit, and differing from each other solely in the anthers, which in *Paraphyllanthus* are erect, with distinct parallel longitudinal cells, whilst in *Euphyllanthus* they are divergent from the centre or reflexed outwards, with oblique divergent or horizontally divaricate cells opening obliquely or transversely with regard to the axis of the flower, and in two or three species the three anthers are confluent in a single ring round the central column. This character, however, is purely artificial, widely separating, for instance, two species so similar as *P. Niruri* and *P. urinaria*; but being apparently constant, the sections are practically useful. 10. *Reidia*, about 25 Old-World tropical species, distinguished from *Euphyllanthus* by the anthers two only, but so divided as to appear like four 1-celled anthers, sessile crosswise at the apex of the column. For the sectional name Mueller has preferred Hasskarl's rather older name of *Eriococcus*; but that was only applied by the author to the species with woolly ovaries, as indicated by the name, and Wight's name *Reidia* was given to the whole of his genus, now forming the section. Lastly, 11. *Xylophyllum*, about 10 tropical American leafless shrubs, with the floral characters sometimes of *Paraphyllanthus*, sometimes of *Euphyllanthus*, but with peculiar flattened phyllodineous branches, which induced their establishment as a distinct genus from the days of Schreber and Gaertner, though not by Linnæus, to whom the genus is sometimes ascribed. There are, among exceptional species in various sections, two or three from New Caledonia or Madagascar with strictly opposite leaves, three or four from various countries with the short flowering branches frequently (but not always) leafless, so as to assume the aspect of racemes of flower-clusters; in the East-Indian *P. bæobotryoides* the male flowers are really in axil-

lary racemes, and in two or three American species they are in loose slender-branched sessile cymes. The *P. fluitans*, discovered in the Amazon and so named by Spruce, is a little floating plant with the aspect of a *Salvinia*; but all these abnormal forms are so closely allied to true species of *Phyllanthus* as not to give them even sectional importance.

Of the remaining genera of this group, *Leptonema* is a single Madagascar species which I have not seen. From the descriptions and from Jussieu's figure it must be very near *Phyllanthus*, but with the male flowers in pedunculate umbels, and the anthers of *Antidesma*. It is probably on that account that Baillon reduces it to *Antidesma* itself, with which the other characters given do not at all agree. *Securinega*, from which we exclude *Fluggea*, differs from the sections *Euphyllanthus* and *Cicca* of *Phyllanthus* solely in the development of a rudimentary pistil in the male flowers, a purely technical character rarely accompanied by any difference in habit. There are only eight or nine species, but as widely scattered as those of *Phyllanthus*, as they include the Spanish *Colmeiroa*, the North-east Asiatic *Geblera*, the South-African *Pleiostemon*, the South-American *S. congesta*, *S. elliptica*, and *S. Schuechiana*, and the Cuban *Acidothamnus*, besides the Madagascar *Gelfuga* and the Arabian *Meineckia*, which I have not seen. The latter plant is said by Baillon to have minute petals, which Mueller denies. *Neorœpera*, comprising two Australian species, is reduced by Baillon to *Securinega*; but I have retained it in the 'Flora Australiensis,' as being well distinguished by habit, by the almost petal-like sepals, by the stamens inserted round a broad flat disk without any rudimentary pistil, and by the undivided styles. Lastly, *Fluggea* and *Breynia* differ from all others of the group in the fruit, which is a 3-celled berry, with the dissepiments sometimes so thin as to be scarcely separable from the pulp, and in the seeds, of which the lower part of the crustaceous testa on the inner side is as it were doubled, leaving a considerable cavity between the two folds. In other respects *Fluggea* corresponds to *Securinega*, as *Breynia* does to *Phyllanthus*, except that in *Breynia* there is a further difference in the peculiarly shaped male perianth. I have in the 'Flora Australiensis' given the reasons why I cannot concur in Mueller's separation of his *Melanthesiopsis* from *Breynia*. In the same work, as there are no true *Securinegas* in Australia, I had not occasion to ascertain the real distinctness of the two genera united by Mueller

under that name, and therefore retained his nomenclature. *Fluggea* and *Breynia* are both of them limited to the Indo-Australian region, the former with six, the latter with twelve species.

Our third group consists of trees or shrubs with alternate leaves and the typical *Phyllanthus* inflorescence, the stamens sometimes uniseriate, but more frequently indefinite, round a broad central disk, or rarely in the centre of the flower, the styles or stigmas dilated and spreading from the base, distinct or forming a sessile reniform or orbicular disk; the fruit fleshy outside, with a hard endocarp, indehiscent or rarely separating ultimately into 2-valved cocci. We here include five genera:—*Petalostigma*, a single Australian species differing from the others in the fruit ultimately separating into 2-valved cocci, although before dehiscence it is globose, with so fleshy an exocarp as to be described by collectors as a drupe. *Putranjiva*, 2 Indian well-known species. *Drypetes*, about 9 tropical American species, including the Brazilian *Treireodendron*, separated by Mueller from *Drypetes* on account of the absence of any rudimentary pistil in the male flower, which is said to be characteristic of the West-Indian typical species. In all, however, the stamens surround a central disk, which, in some of the Cuban species, is scarcely convex and certainly not protruding into what can be termed a rudimentary pistil. *Hemicyclia*, 9 species from the Indo-Australian region, with the pistil reduced to a single carpel, as it is also in some species of *Drypetes*; and *Cyclostemon*, about 18 species from tropical Africa and Asia. Mueller includes among the latter Hasskarl's *Dodecastemon*, which is unknown to me, but if the styles are really filiform it probably belongs to some other group.

The fourth group, perhaps rather artificial, consists of Old-World trees or shrubs with constantly opposite or verticillate undivided leaves, the axillary inflorescence looser or more branched than in the preceding groups, but usually short; the flowers apetalous, the stamens various, the styles undivided, linear or short, thick and erect or somewhat spreading. There are six genera:—1. *Dissiliaria*, 3 Australian species, from which Baillon has recently separated the *D. tricornis* under the name of *Choriceras*, on account of the persistent bases of the three styles being at a considerable distance from each other, forming as many dorsal tubercles or horns to the cocci. But this character alone can scarcely be regarded as of generic value; for,

in the two genera where it is most conspicuous, *Buxus* and *Styloceras*, it does not pervade all the species. The three species included in *Dissiliaria* in the 'Flora Australiensis' may not be all strictly congeners; but they are as yet insufficiently known to supply reliable distinctive characters. 2. *Longetia*, and 3. *Buræavia*, two New-Caledonian genera of two species each. 4. *Choriophyllum*, one species from the Malayan archipelago, described in 'Hooker's 'Icones,' tab. 1280. 5. *Toxicodendron*, two species from South Africa: one is Thunberg's original one, fully described and figured by Lambert under the name of *Hyænanche*, with the leaves usually in whorls of three or four; the other a new one, with opposite leaves, recently sent from British Caffraria by Mr. and Mrs. Barber. This last may be thus characterized:—*T. acutifolium*, Benth., foliis oppositis elliptico-lanceolatis utrinque acutatis subdentatis, floribus ♂ simpliciter racemosis. Folia breviter petiolata, 3–6 poll. longa, 1–1½ poll. lata, coriacea, glabra, læviuscula, tenuiter pennivenia, venis primariis a margine distanter anastomosantibus; flores ♂ 6–10, in racemum axillarem subpollicarem dispositi, pedicellis oppositis brevibus divaricatis bractea parva subtensis. Flores ♂ omnino *T. capensis*, ♀ ignoti. It does not appear why both Mueller and Baillon have suppressed Thunberg's name for the genus in favour of Lambert's. The name *Toxicodendron* had previously been given only by prelinnean botanists to a species of *Rhus*, and by Gaertner to a species of *Schmidelia*, which from the fruit alone he had failed to recognize. The 6th genus, *Mischodon*, a single Ceylonese species, had been placed by Thwaites among genera with uniovulate cells, until Beddome pointed out the error, showing that in the ovary they are constantly 2-ovulate, although, as in many other genera, only one in each cell is fecundated.

We have next grouped together three genera which may not ultimately prove to have any close natural affinity, but have a foliage remarkably exceptional in Phyllantheæ, although in Crotoneæ it may pass into more ordinary forms. The leaves are digitately compound, whereas in all other Phyllantheæ they are simple and penniveined. In Crotoneæ, on the other hand, digitate primary veins are frequent, and in several genera the leaves pass from that into digitately lobed or compound ones. The flowers of the group are apetalous, the inflorescence axillary but loose, the stamens 1-seriate or 2-seriate, the styles, where known, slender and undivided, the fruit various. The genera are:—1. *Oldfieldia*,

a single tropical African species, with a hard globular loculicidal capsule. On this account Mueller proposed removing the genus to Sapindaceæ, from which it appears to me to differ in several important particulars, and the loculicidal dehiscence with entire valves is now known in Euphorbiaceæ of various tribes. 2. *Bischofia*, a single tropical Asiatic species with an indehiscent berry. And 3. *Piranhea*, a single tropical American species with a hard globular capsule, separating at length into shortly 2-valved cocci. Although these three genera may differ considerably from each other, yet neither of them appears to be nearly connected with any other one.

Our last group is characterized chiefly by the inflorescence, which I once thought might have been sufficient to raise it to the rank of a distinct tribe; and some of the genera have even been regarded as types of distinct orders; but the other characters have proved so various, though always within the general limits of Phyllantheæ, that I have followed Mueller in including them in that tribe. The leaves are alternate and undivided, the male flowers in catkin-like or slender spikes or racemes either simple or paniculately branched, the calyx variously divided but not valvate, the petals rare, the stamens usually but not quite always uniseriate round a central disk or rudimentary pistil, the styles various. The fruits suggest the subdivision of the group into two series. In the first we have nine genera, with the fruit drupaceous and indehiscent, or very rarely opening tardily in loculicidal valves, viz.:—1. *Uapaca*, 7 African or Mascarene species, with the globular male amenta and solitary female flowers enclosed in globular involucres of four or six bracts, which become reflexed as the flowers expand; the flowers are apetalous, the males with a minute calyx, the females without any at all. It is true that both Mueller and Baillon describe the involucre of the female flower as a calyx; but it is so precisely similar in form and insertion to the male involucre that it is difficult to deny its homology. The fruit is fleshy, with three pyrenes. 2. *Aporosa*, the typical genus of Lindley's order Scepaceæ, but really closely allied both to *Baccaurea* and to *Antidesma*; some species even have been first described under the latter name. It is chiefly exceptional in the rudimentary pistil of the male flowers being exceedingly minute or wholly wanting. The ovary is 2-celled; but the fruit, a small, almost dry drupe, ripens usually only a single seed, as in *Antidesma*, or very rarely opens at length

in two valves. There are about 20 species, all from tropical Asia (including the Archipelago). 3. *Daphniphyllum*, an exceptional tropical Asiatic genus of about 11 species, rejected from the order by Mueller on account of the smallness of the embryo, which varies from about one sixth to one fourth of the length of the albumen. This embryo, however, is shaped like that of some species of *Baccaurea*, which appears to be the genus to which *Daphniphyllum* is the nearest allied in habit as well as in character. The stamens are exceptional in the group, being nearly those of *Toxicodendron*, *Styloceras*, and *Simmondsia*, without any rudimentary pistil. The fruit is an indehiscent, usually 1-seeded drupe. 4. *Baccaurea* (*Pierardia*, Roxb.), extending in about 30 species over tropical Asia to the Pacific islands. The fruit is fleshy, at length much hardened and indehiscent, or in some species opening tardily in loculicidal valves. These dehiscent species, forming Jack's genus *Hedycarpus*, have been rejected from the order on account of that dehiscence, of which, however, as already observed, many examples are now known in Euphorbiaceæ; and in one or two species of *Baccaurea* the dehiscence is very tardy and apparently not constant. Endlicher transfers *Hedycarpus* to Sapindaceæ, from which it widely differs in structure. *Platystigma* of Wallich's Catalogue, no. 7523, is a Silhet plant of which female specimens only are known; these flowers are nearly those of *Hemicyclia*; but the habit and inflorescence are those of some species of *Baccaurea*; at any rate the genus cannot be established until the male flowers are known; and the name is preoccupied in Papaveraceæ. 5. *Cometia*, 2 Madagascar species unknown to me; but from the character given they seem to belong rather to this group than to our third one, though, like *Daphniphyllum*, the female flowers must be nearly those of *Hemicyclia*; Baillon describes the male flowers as having a rudimentary pistil, which Mueller denies. 6. *Antidesma*, a well-known and distinctly characterized genus, of which above 60 species are described, many of them very ill-defined. It spreads over tropical Africa and Asia, extending in the east from Australia to Japan and the Pacific islands, but unknown in America. The fruit is a small, usually oblique, indehiscent drupe. 7. *Mæsobotrya*, a single African species, connecting *Antidesma* with *Hieronyma* and *Thecacoris*, published in Hooker's 'Icones,' plate 1296. 8. *Hieronyma*, under 10 species, the American representative of *Antidesma*, with which it is reunited by Baillon, but was

well distinguished by Tulasne by the calyx, the 2-celled ovary, &c. The indumentum is usually but not quite always scaly or scurfy, which it never is in *Antidesma*. 9. *Æxtoxicon*, a single Chilian species whose affinities have been much disputed. I can, however, see no reason for rejecting Sir W. Hooker's original view of its connexion with Euphorbiaceæ. The indumentum is that of *Hieronyma*, the flowers nearly those of *Antidesma*, except that it has very prominent petals, nearly those of *Dicœlia* and *Galearia*; the globose bract that encloses the bud is like that of *Pera*; the fruit is nearly that of *Antidesma*; but the seed is remarkable for its slightly ruminate albumen.

The second series, with the fruit separating into cocci, comprises four genera:—1. *Hymenocardia*, 5 species from tropical Africa and Asia, with remarkably flat cocci opening only on their inner margin. Kurz, in his 'Forest Flora of Burma,' describes the cells of the ovary as uniovulate, and unites with it the very different *Coccoceras*. I have, however, like all others who have described the genus, always found the ovules in pairs in the flowering state, although, like many especially drupaceous genera, one ovule of each cell proves constantly abortive. The flowers of *Hymenocardia*, are apetalous, as well as those of 2. *Richeria*, 3 tropical American species, including *Podocalyx* of Klotzsch, which Mueller keeps up as a section of *Richeria* on account of a difference in the anthers, said to open outwards instead of inwards, a difference not very clear if the anthers are taken at the same stage. The slits of the cells appear to me to be lateral, a little turned inwards in the bud, outwards after shedding the pollen. 3. *Thecacoris*, 4 species, of which three from tropical Africa have small petals; the fourth, or typical Madagascar species, is unknown to me, and is said to be apetalous. 4. *Cyathogyne*, a single tropical African apetalous species, exceptionally herbaceous.

There remains the anomalous genus *Dicœlia*, described and figured in Hooker's 'Icones,' tab. 1289, from a Bornean specimen of Beccari's. The loose, often androgynous clusters or cymules along the rhachis of the racemes is different from any Phyllanthean inflorescence; the peculiar petals and stamens are only known in *Galearia*, from which *Dicœlia* differs in the axillary racemes and especially in the biovulate cell of the ovary, with no tendency in the young seed to assume the exceptional form of that of *Galearia*. It is, however, probably with that genus that

the real affinity of *Dicœlia* must be traced out, notwithstanding the difference in the number of ovules, which place it technically in a different tribe.

Payeria of Baillon proves to be *Quivisia*, Cav., described from far advanced specimens, the anthers having fallen away from the staminal tube, or having been perhaps overlooked.

5. Galearieæ.

I have here grouped together four genera which partake of the characters both of Phyllantheæ and Crotoneæ, but cannot be strictly referred to either tribe. They may not really have much affinity with each other; but all are as it were intermediate between the two great tribes, having the stamens of the outer or single series opposite the sepals as in Phyllantheæ, with the uniovulate cells of Crotoneæ. All have simple undivided penniveined leaves; and all have small calyces with imbricate teeth lobes, or segments; and all have definite stamens round a central rudimentary pistil; but in other respects they differ considerably. 1. *Galearia*, about 12 Malayan species, has simple terminal slender racemes, curiously shaped almost valvate petals, much longer than the calyx, the ovules and seeds much broader than long, with a lateral micropyle and a small, broad, indehiscent, drupaceous fruit. 2. *Microdesmis*, with one or two tropical African and one or two tropical Asiatic species, has the flowers clustered in the axils, the petals much longer than the calyx, as in *Galearia*, but of a normal shape and imbricate, the ovules and seeds normally shaped, the fruit a small indehiscent globular drupe. *Pentabrachion*, a single tropical African species, does not appear to me to be generically distinct from *Microdesmis*; but the specimens are incomplete. 3. *Pogonophora*, one tropical American species, has axillary, slender, paniculately branched racemes, petals much longer than the calyx, and the capsule separating into three 2-valved cocci. 4. *Tetrorchidium*, of three or four tropical American species, is apetalous, the racemes axillary, sometimes branched, and the fruit separates into cocci. The small calyx, and the anthers opening in four valves like those of *Endospermum*, had induced its being placed amongst Hippomaneæ, from which, however, the position of the stamens and the rudimentary pistil would remove it. Altogether the place of the genus is as yet very uncertain. Mueller described three species in the 'Prodromus;' a fourth is added in the 'Flora

Brasiliensis,' differing much in habit and slightly in character, but evidently a congener.

6. Crotoneæ.

The Crotoneæ, extending them, as we should propose, to all Euphorbiaceæ with uniovulate cells to the ovary, without the special characters assigned to any of the preceding tribes, comprise two thirds of the genera, though less than one third of the species of the whole order. The genera are, with few small exceptions, tropical; they are mostly, but not all, shrubby or arborescent; the leaves are rarely opposite, the flowers in axillary clusters only in a very few genera; otherwise both foliage and inflorescence are much varied. Digitate primary veins in the leaves are frequent, and in some genera pass into digitately lobed or compound leaves; and racemose or spicate male infloresences, axillary or terminal, are very prevalent. In the flowers, the calyx is very frequently valvate; the petals, when present, are usually much more developed than in Phyllantheæ; the stamens are frequently central and indefinite, sometimes exceedingly numerous, and, when few and definite, those of the outer or single series are always alternate with the sepals or opposite the petals. The fruit is usually the normal Euphorbiaceous capsule, separating elastically into 2-valved cocci; but in a very few genera it opens loculicidally in entire valves; or the cocci remain closed; or the whole fruit is apparently indehiscent, forming in two or three genera a several-celled drupe. The indehiscent one-seeded drupe, frequent in Phyllantheæ, has not been observed in Crotoneæ; and there is only one monotypic genus in which the albumen is reduced to a membrane enclosing the large embryo with thick fleshy cotyledons. Notwithstanding, however, these general differences between the two great tropical tribes, there remains only as a positive character the uni- or biovulate ovary-cells, one which we overlook in Stenolobeæ and Buxeæ; and it is not impossible that a further acquaintance with the rather numerous imperfectly known genera, and the discovery of new ones, may induce a better distribution of the genera not always governed by this one character. In the meantime a subordinate grouping of the 120 genera of the Crotoneæ has become necessary for practical use; the division proposed by Mueller, relying sometimes absolutely on slight differences in the calyx, on the presence or absence of the rudimentary pistil, &c., has frequently

the inconvenience of widely separating very closely allied genera, or of collecting in one genus most dissimilar species; and the characters of Baillon's series are not sufficiently explicit. I have endeavoured, however, to conciliate the views of both in proposing eight subtribes, some still too artificial, but, as I am led to believe, fairly recognizable. They are based much on inflorescence, partly on calyx and other floral characters. The first three are usually but not always petaliferous, at least in the males, the remaining five always apetalous.

Subtribe 1. JATROPHEÆ. Flowers usually in a terminal 2–3-chotomous centrifugally cymose panicle, often androgynous with the female flower central and solitary or several in the primary forks, the lateral ones all male, but sometimes unisexual, and occasionally reduced to a terminal cluster, or the female flower very rarely alone and terminal. The floral characters are various, the petals being wanting in several genera; but the inflorescence appears to be constant and readily observed. All the genera, except two small ones, are in America, and most of them chiefly or entirely from that hemisphere. The first five are always apetalous, the other six usually petaliferous, at least in the males. They are:—1. *Elateriospermum*, a single species from the Malayan archipelago, with very imbricate sepals and indefinite stamens, without any rudimentary pistil. The large seeds are quite exceptional in Crotoneæ, the albumen being reduced to a chartaceous membrane enclosing the embryo, of which the cotyledons are very thick and fleshy, enclosing at the base the small radicle. 2. *Cunuria*, and 3. *Micrandra*, two well-defined Brazilian genera of two or three species each, well placed in juxtaposition by Baillon, although Mueller had associated *Micrandra* by some mistake with Eucrotoneæ. 4. *Avellanita*, a single Chilian species, only known to me from Philippi's description, which would seem to place it in this group. The calyx described is that of *Aleurites*; but there are no petals, and the capsule is a normal 3-coccous one. 5. *Hevea*, nine tropical American species, with digitately 3-foliolate leaves and a shortly lobed or toothed calyx, but otherwise with very nearly the characters and, as stated by Spruce, the habit of *Cunuria*. 6. *Joannesia*, the *Anda* of Jussieu, a single well-known Brazilian species. 7. *Jatropha*, the principal genus of the subtribe, of which the species have been extended by the 'Flora Brasiliensis' to 68,

in a large proportion American, and distributed by botanists into three very distinct sections, established by Pohl, with some plausibility, as independent genera:—1st, *Curcas* has the petals united in a single lobed corolla; the species are chiefly American, with two or three from Africa or East India; the section also includes *Mocinna* of Ortega, a Mexican species remarkable for its succulent branches, small leaves, and sessile clusters of few flowers, but with all the characters of the section: 2ndly, *Adenoropium*, with the petals free or nearly so, to which, besides several American species, belong all the known African *Jatrophæ*: 3rdly, *Cnidoscolus*, which I should have been much disposed to maintain as a genus, but that Mueller and Baillon both concur in reducing it to a section of *Jatropha*; there are no petals, but the calyx is quite exceptional in the tribe, hypocrateriform and petal-like; the species are all American. 8. *Acidocroton* is a single Cuban species, copiously armed with infrastipular prickles, otherwise with much of the habit and character of *Mocinna*, but not so easily reducible to *Jatropha*. 9. *Tritaxis*, a genus originally founded by Baillon on a Cochin-Chinese plant (known to me only through the detailed descriptions), of which he well pointed out the affinity with *Jatropha*, although he has since, in his 'Histoire des Plantes,' followed Mueller in reducing it to *Trigonostemon*. To my eyes it differs essentially from that genus in inflorescence as well as in the stamens, which are nearer those of *Ostodes* or of some species of *Jatropha*, and some minor characters. To the original species I would add the *Trigonostemon Cumingii*, Muell. Arg. (forming Mueller's section *Anisotaxis*, with a compact sessile terminal cyme), and a new species, from the peninsula of India, with the loose inflorescence of the original one. I would thus characterize the three:—(1) *T. Gaudichaudi*, Baill.: foliis dentatis, cymis laxis pedunculatis, staminum verticillis 2 pentandris infra terminalem triandrum: Cochin-china (*Gaudichaud*).—(2) *T. Beddomi*, Benth.: foliis integerrimis v. vix sinuato-dentatis, cymis laxi pedunculatis glabris, staminum verticillo unico pentandro infra terminalem diandrum: Tinnevelly, East-Indian peninsula (*Beddome*).—(3) *T. Cumingii*, Muell. Arg. (*Trigonostemon*): cymis densissimis sessilibus pubescentibus, staminum verticillo unico pentandro infra terminalem triandrum: Philippines (*Cuming*, n. 1693). It is very probable that a specimen gathered by Kurz in the South Andaman Islands may prove to be a fourth species, with the

loose slender inflorescence of *T. Beddomi*; but the flowers are not in a state to determine their structure. 10. *Aleurites* comprises two well-known trees from Eastern Asia and the Pacific islands, with the calyx of Acalypheæ, but allied to *Jatropha* in inflorescence, petals, and other characters. The two species are so different in aspect that they were formerly regarded as distinct genera. The typical *A. moluccana*, included by Linnæus in *Jatropha* is frequently sent from tropical America as well as other tropical regions, but generally as planted or introduced. There are, however, two tropical American species—one from Mexico (*Ervendberg*, n. 373), the other from Guiana (*Rob. Schomburgk*, n. 474, *Rich. Schomburgk*, n. 759)—with precisely the inflorescence and male flowers of *A. moluccana*, but with specific differences in the leaves and indumentum; but the female flowers being unknown and the native country so different, it is better to leave them unnamed. The second known species, which was Jussieu's genus *Elæococca*, is chiefly remarkable for the few large flowers and more numerous carpels to the pistil. 11. *Garcia*, is a single tropical American species, with the panicle reduced to a terminal cluster, or even to a single flower. The calyx is that of the Acalypheæ, and the narrow petals much more numerous than in any other Euphorbiaceous genus. Mueller, on this and some other occasions, makes use of the circumstance that the number of petals is twice or more than twice that of the calyx-divisions to distinguish subtribes; but the character is very unsatisfactory, for in the genera in question it cannot well be ascertained what is the real number of sepals of which the calyx is composed. They are so completely united in the bud as to show no trace of their sutures; their venation is very indistinct; and when the flower expands, the calyx bursts very irregularly into two or three fragments, which are evidently not separate sepals. It is probable that, except perhaps in *Garcia*, the real number of sepals composing the calyx is always the same as that of the petals, as it certainly is wherever the sutures are traceable.

Subtribe 2. Eucrotoneæ. This is Mueller's tribe Crotoneæ with the exclusion of *Micrandra*, or Baillon's series Crotoneæ. It is in fact the natural genus *Croton*, with two or three small ones technically separated from it. It is the largest genus in the order after *Euphorbia*, having been extended to about 500 species by the last additions contained in the 'Flora Brasiliensis.' The great

majority are American, extending even beyond the tropics both in the northern and southern hemisphere. There are also a few species both in Africa and in the Indo-Australian region, but mostly tropical. All are connected by distinct characters readily observed. The inflorescence is a terminal spike or raceme, the male flowers usually clustered, the females singly inserted along the rhachis, or sometimes a female in the centre of the male cluster or cymule; in the males the calyx is valvate or slightly imbricate, and the petals are rarely wanting; the stamens indefinite and central, few or numerous; the anthers adnate, inwardly pendulous in the bud owing to the inflection of the filament, and becoming erect as the flower expands—a peculiarity which forms the most essential character of the subtribe. The female flowers are more generally apetalous, the styles variously divided, the fruit the normal Euphorbeaceous capsule separating into 2-valved cocci. The arrangement of the numerous species is in a very unsatisfactory state. Mueller established 10 sections exceedingly unequal and all very artificial, and yet not always easy to distinguish, each one, even those of only two species, comprising the most dissimilar forms. Baillon has in various papers proposed about 22 sections, and some of them apparently quite natural; but he has given no comparative key to them, and many species do not appear to fit well into any of them; so that they are practically of little use. Klotzsch separated above 20 genera upon characters usually based on the examination of single species, and deservedly rejected by subsequent botanists. The most apparent characters, derived from inflorescence, indumentum, number of stamens, ramification of the styles, etc., are often very vague; a satisfactory revision of the divisions can therefore only be effected by great patience and the sacrifice of more time than I can bestow upon it. I have therefore, in the 'Genera,' merely passed Mueller's sections and subsections in review, comparing them as far as I was able with Baillon's sections and Klotzsch's genera. Of the three smaller genera closely allied to but retained as distinct from *Croton*, *Julocroton*, about 20 tropical or subtropical American species, is little more than a section of *Croton* with a compact spike and more irregular calyx; *Crotonopsis* is a slender North-American annual, with a normally 2- or 3-celled ovary, but the capsule constantly small, 1-seeded, and indehiscent; and *Eremocarpus* is a single North-American herb, with the pistil reduced from the first to a single uniovulate carpel.

Subtribe 3. CHROZOPHOREÆ. I have here included all the petaliferous genera of Crotoneæ which have neither the cymose panicle of Jatropheæ nor the peculiar stamens of Eucrotoneæ. The inflorescence is usually in simple or paniculately branched axillary spikes or racemes, the males clustered or singly inserted, the females usually singly inserted along the rhachis; occasionally, however, the racemes are terminal, or the male clusters are loose and cymulose; and very rarely the inflorescences are reduced to sessile axillary clusters or cymules. The 24 genera may for practical convenience be distributed into three or four subordinate groups, which, however, must not be considered absolute expressions of natural affinities.

We have, first, four genera remarkable for the consolidation of the petals in the male flowers into a single lobed corolla. Mueller, it is true, believes them not to be really consolidated, but only cohering and separable; and he may be right theoretically; but practically, here as in the section *Curcas* of *Jatropha*, they are quite united, and at least in *Manniophyton* and *Pausandra* cannot be separated without tearing. In the corresponding females the petals are free, and the character may be rather a convenient technical than a really natural one. The genera, all well-defined and requiring no comment, are:—1. *Givotia*, a single East-Indian species; 2. *Ricinodendron*, a single tropical African species, first described as a species of *Jatropha*, to which genus it appears to me not to have the slightest resemblance, but in which it is inadvertently retained in the 'Prodromus,' though repeated as an independent genus; 3. *Manniophyton*, 3 or 4 tropical African species, including an unpublished one from Schweinfurth's collection; and 4. *Pausandra*, a single tropical American species.

A series of ten genera have the inflorescence in axillary or sometimes terminal racemes or spikes, sometimes very long, sometimes quite short and few-flowered, the male calyx with imbricate divisions or open and shortly lobed or toothed, the petals free in both sexes. These genera have been variously intermixed by Mueller or by Baillon, but appear to me to be reducible to natural and fairly defined limits. 1. *Trigonostemon*, which I would limit to about ten species from East India and the Malayan archipelago, all with 3 or 5 anthers sessile round the apex of the staminal column, and which may be distributed into 3 sections:—*Eutrigonostemon*, including Mueller's *Eutrigonostemon* § 2 and *Silvæa*, with axillary racemes and the three anthers erect and usually bifid;

Telogyne of Mueller, differing from *Eutrigonostemon* in the anthers 5 instead of 3; and *Pycnanthera*, for Mueller's *Eutrigonostemon* § 1, in which the racemes are terminal, and the three anthers are adnate on the top of the column, with the cells transverse in one species, radiating in the other. Of the other sections included by Mueller in the genus, *Cheilosopsis* has the anthers in 2 or 3 series, and all the other characters of *Ostodes*; and, indeed, *Trigonostemon zeylanicus*, Muell. Arg., is evidently specifically identical with *Ostodes minor*, Muell. Arg. *Tritaxis* including *Anisotaxis*, and *Dimorphocalyx*, are restored to the rank of distinct genera. One species, *Trigonostachys lævigatus*, Muell. Arg., is very anomalous, differing from the genus in habit, inflorescence, and stamens, and is probably *sui generis*; but the females are unknown, and therefore it cannot be safely established as distinct. 2. *Paracroton*, a single Javan species, with terminal pendulous racemes of 2 or 3 feet, is unknown to me; but, from the character given, it would belong to the present group, differing from all other Euphorbiaceæ, except *Galearia*, in the seeds broader than long. 3. *Ostodes*, 4 or 5 species from East India and the Malayan archipelago, including Mueller's section *Cheilosopsis* of *Trigonostemon*, and probably *Fahrenheitia* of Zollinger. Among Mueller's species, however, *O. Helferi* from Moulmeyn, forming his section *Geloniastrum*, is unknown to me, and, with its flowers in axillary clusters and anthers opening outwards, can scarcely be a congener. We have a Malayan plant from Maingay with the inflorescence as described in *O. Helferi*; but the anthers open inwards, and, having no female, the genus cannot be determined. 4. *Codiæum*, a most unnatural and heteromorphous genus as variously extended by Mueller and by Baillon; but if reduced to the section *Eucodiæum*, it forms a natural and well-defined group of about 4 species, extending over the Malayan archipelago, tropical Australia, and the South Pacific islands. All have slender axillary racemes, a small appressed male calyx, very short petals in the males, deficient in the females, the receptacle in the male flower scarcely raised, the styles slender and undivided, with other minor distinctive characters. Of Mueller's sections, we adopt *Blachia* and *Baloghia* as distinct genera, and refer *Tylosepalum* to *Trigonostemon*, as far as we can judge from imperfect specimens. 5. *Baloghia*, including *Steigeria* of Mueller as extended by Baillon in the 11th vol. of his 'Adansonia,' now comprises about 9 New-Caledonian species, one of which is also in Norfolk Island and Australia. They all differ from *Codiæum*,

in which Mueller and Baillon include them as sections, in habit, in their short terminal racemes, spreading or reflexed calyx, longer petals, much-raised conical or columnar receptacle in the male flower, divided styles, and other minor characters. 6. *Alphandia*, 2 New-Caledonian species unknown to me, but which from Baillon's character must be nearly allied to *Baloghia*. 7. *Fontainea*, Heckel, as referred to by Baillon in the 11th vol. of 'Adansonia,' and described Hist. Pl. v. 194, a single New-Caledonian species, found also in Australia, now shown to differ from *Baloghia* in several important characters, especially in the drupaceous fruit, which was unknown to me when describing it under *Baloghia* for the 'Flora Australiensis.' 8. *Blachia*, originally established by Baillon, but reduced by Mueller to a section of *Codiæum*, from which it differs in habit, in the peculiar terminal inflorescence, the slender pedicels of the male flowers forming an umbel or a very short loose raceme at the end of the peduncle, in the small imbricate male calyx, the scale-like glands of the disk as long as the short petals, the divided styles, the fruiting perianth more or less enlarged and foliaceous, or very deciduous. It now contains 5 Asiatic species much resembling each other in foliage, but distinguishable by the following characters:—(1) *B. umbellata*, Baill.: floribus masculis ad apicem pedunculi stricte umbellatis, calyce fructifero parum aucto patente segmentis obtusis: Ceylon.—(2) *B. reflexa*, sp. n.: floribus masculis ad apicem pedunculi stricte umbellatis, calyce fructifero parum aucto arcte reflexo segmentis acutis: Neilgherries (*G. Thomson*).—(3) *B. Pentzii* (*Codiæum*, Muell. Arg.): floribus masculis in pedunculo tenui 2–3-umbellatis, calyce fructifero parum aucto patente, segmentis obtusis: China, prov. Kwantung (*Hance*), Hainan (*Swinhoe*).—(4) *B. calycina*, sp. n.: floribus masculis apicem versus pedunculi laxe racemosis v. subumbellatis, calyce fructifero valde aucto patente segmentis acutis foliaceis: Neilgherries (*G. Thomson*), also in Rottler's herbarium.—And (5) *B. denudata*, sp. n.: floribus masculis in pedunculi parte superiore subracemosis, calyce fœmineo jam sub anthesin deciduo, fructu denudato; folia quam in cæteris speciebus majora: Malabar hills (*Low*, *Stocks*, *Ritchie*, *Dalzell*). 9. *Dimorphocalyx*, 3 or 4 species or marked varieties from Ceylon, the Indian peninsula, and the Malayan archipelago, including *Codiæum andamanicum*, Kurz, referred by Mueller to a section of *Trigonostemon*, but differing much in inflorescence, in the male calyx, in the stamen, in the much-enlarged

foliaceous fruiting calyx, and in other characters. 10. *Sagotia*, a single tropical American species, with the enlarged fruiting calyx nearly of *Blachia* and *Dimorphocalyx*, but with very peculiar anthers, and the capsule opening rather in valves than separating into cocci.

Cluytia, of which 28 species have been published from southern and tropical Africa, stands alone in the subtribe: the inflorescence and habit are those of Phyllantheæ; but the essential characters are those of Chrozophoreæ.

The subtribe closes with nine genera having the male calyx valvate and the petals free in both sexes. The first four have a rudimentary pistil prominent at the apex of the staminal column, or in the centre of the free stamens; the remaining five have no trace of the pistil in the male flower. 1. *Agrostistachys*, which Baillon has with good reason united with *Sarcoclinium*; but the former name appears to have the right of priority. The very singular short spikes of the typical *Agrostistachys*, which have been compared to the spikelets of Gramineæ, pass gradually in some species into the long slender spikes or racemes of *Sarcoclinium*. There are 6 or 7 species, natives of tropical Asia and Africa; for to the five described in the 'Prodromus' must be added one or two unpublished Malayan ones with exceedingly long racemes. 2. *Argithamnia*, about 37 American tropical and subtropical species, well characterized and divided into sections in the 'Prodromus,' from which, however, I would exclude and retain as a distinct genus the North-Chinese *Speranskia*. 3. *Caperonia*, an American genus extending sparingly into tropical Africa, well distinguished both in habit and character: 19 species have been enumerated; but many of them run so much into one another that the number will probably have to be much reduced. 4. *Pseudocroton*, a very well-marked Guatemalan species, with much of the habit and the scurfy indumentum of many species of *Croton*, but with the characters of Chrozophoreæ. 5. *Sumbavia*, 2 species from the Malayan archipelago, differing but little in habit or characters from *Mallotus*, except in the presence of petals. 6. *Tannodia*, a single Madagascar species, unknown to me except from description. 7. *Crotonogyne*, a single tropical African species, of which the characters are as yet in some measure doubtful, the only known specimens being imperfect. 8. *Chrozophora*, about 6 species, extending from the Mediterranean region into tropical Africa and Asia, very well defined

as a genus, and natural if left within the limits assigned to it by Mueller and, I believe, all botanists except Baillon; the species, however, are very much confused and often difficult to distinguish. And 9. *Speranskia*, a single North-Chinese herbaceous species, with the habit of a *Croton*, but united by Mueller with *Argithamnia*, from which it appears to me to differ as much in character as in habit and geographical position.

Subtribe 4. ADRIANEÆ. I have here collected five genera, rather upon technical grounds than upon any very evident natural affinities; but their separation rendered the distribution of the great mass of apetalous Crotoneæ rather less complicated. They have the terminal centripetal spikes or racemes of Eucrotoneæ, either simple or very rarely branched at the base, but are always without petals. The calyx and styles are often those of Acalypheæ, from which they differ chiefly in inflorescence. 1. *Manihot*, an American genus, chiefly Brazilian, of which about 80 species have been distinguished, stands alone with its large coloured calyx, shortly toothed or imbricately lobed, and a peculiar habit. It was once united with *Jatropha*, but has really few characters in common with that genus, except sometimes a resemblance in foliage; and I am not aware of any other genus to which it can be said to be nearly allied. The other four genera have the male calyx of Acalypheæ, globose and closed in the bud and valvately splitting as the flower expands. 2. *Adriana*, 5 Australian species, regarded by Ferd. Mueller as varieties of one, and 3. *Pachystroma*, a single Brazilian species, are both well-marked genera, without the rudimentary pistil in the male flower, which is well developed in the remaining two genera. 4. *Cephalocroton*, 2 African species, and with a peculiar habit and remarkable for the twice bent filaments, with other characters, which tempt one to consider it as an apetalous section of *Croton*. 5. *Adenochlæna*, three East-Indian species, two of which are united in the 'Prodromus' with *Cephalocroton*, but they appear to me to be strict congeners of *Symphyllium*, a name, however, which must give way to the older one *Adenochlæna*. The genus thus differs from *Cephalocroton* in habit as well as in the uniseriate stamens with erect filaments. The three species would be:—*A. zeylanica*, Thw., from Ceylon; *A. indica*, Bedd., from the Peninsula; and *A. Silhetensis* (*Symphyllium Silhetense*, Baill.) from Silhet.

Subtribe 5. ACALYPHEÆ. A series of nearly forty apetalous

genera having the male spikes or racemes axillary, or the upper ones forming a terminal panicle, very rarely reduced to sessile clusters; the male calyx is either globular and closed in the bud, and splitting irregularly or into distinct sepals, or in a few genera is more open with slightly imbricate lobes, but always more developed than in Hippomaneæ; the styles free or shortly united at the base, in a very few species only forming a longer column much more slender than in Plukenetieæ. The genera are very difficult to distribute into groups; for the characters separating them are often slight or uncertain. I have, however, attempted the following, viz.:—

Our first group is distinguished chiefly by the anthers with 2 or sometimes 4 small globular or shortly oblong cells, quite separate, and erect or spreading when fully out. It comprises 9 genera. 1. *Bernardia*, 24 tropical or subtropical American species, distributed by Mueller into 6 sections upon characters of little importance. His limitation of the genus, as corrected in the 'Flora Brasiliensis,' to the exclusion of the typical species of *Adenophædra*, has been adopted by Baillon. Then follow eight Old-World genera, all except one united by Baillon in the single genus *Mercurialis*, but scattered far and wide by Mueller into different subtribes of his two great tribes Acalypheæ and Hippomaneæ. To me they appear to be all so closely allied as to require juxtaposition; but I cannot concur in their union into a single genus. They are:—2. *Erythrococca*, a single slender prickly shrub from tropical Africa, characterized chiefly by the capsule reduced to a single globular indehiscent one-seeded carpel. 3. *Hasskarlia* is a very distinct tropical African shrub, admitted as a genus both by Mueller and Baillon, and compared by the latter to *Tetrorchidium* on account of the 3 nearly sessile 4-lobed anthers. It differs, however, essentially in the anthers alternate with, not opposite, the sepals; and the male inflorescence is that of *Claoxylon*. 4. *Claoxylon*, a genus of above 40 species, chiefly East-Indian or from the Malayan archipelago, but extending from tropical Africa to Australia and the South-Pacific islands. They are all shrubby or arborescent, and readily recognized by the shape of the anthers. They are distributed in the 'Prodromus' into five sections (without *Micrococca*), according to small differences in the disk or margin of the receptacle in the male flowers. This disk, however, is often so minute as to be difficult to observe accurately; and the character is not

aided by others. The genus requires, therefore, redivision upon other principles. 5. *Micrococca*, a common annual weed of cultivation in tropical Africa and Asia. It has been united, first by Thwaites and subsequently by Mueller, with *Claoxylon*, of which it has nearly the anthers but not the habit; and in the narrow linear appendages of the hypogynous disk, and other characters, it comes nearer to *Mercurialis*. 6. *Mercurialis*, six well-known species, almost entirely extratropical in the northern hemisphere of the Old World. 7. *Leidesia*, two species, 8. *Adenocline* (including *Paradenocline*), three or four species, and 9. *Seidelia*, one species, are all small herbs, mostly annual, from South Africa, all evidently very nearly allied in habit and character, although Mueller places *Leidesia* next to *Mercurialis* in Acalypheæ, *Adenocline* as a distinct subtribe in Hippomaneæ, and *Seidelia*, by some extraordinary misconception, in a section of *Tragia*. Some of these little South-African *Mercurialis*-like plants have the cotyledons narrower than usual in the tropical tribes, and showing some approach to those of Stenolobeæ.

A second group, distinguished chiefly by the form of the anthers and generally by the styles, consists of the universally acknowledged genus *Acalypha*, of about 220 species widely distributed over the tropical and subtropical regions of the globe, together with *Mareya*, two species (or varieties of one) from tropical Africa, which I had formerly published as species of *Acalypha*, but which Mueller seems to have had good grounds for separating. Among the various series proposed for grouping the species of *Acalypha*, the only one with characters positive enough to assign to it sectional value is *Linostachys*, comprising a few American and one Asiatic species, with a very exceptional slender paniculate female inflorescence.

Our third group is a series of nineteen genera, some of them showing but little connexion with each other, but none of them having the special characters by which the other groups of Acalypheæ are distinguished; all, except *Alchornea*, are limited either to America or to the Old World; the first ten are technically characterized by the stamens rarely more than 8, and often much fewer—the remaining nine having them rarely under 15, and often much more numerous. They are:—1. *Adelia* (the Linnean name, replaced in the 'Prodromus' by *Ricinella* for reasons which I have shown above, p. 193, to be inadequate), 7 tropical American, chiefly West-Indian shrubs, with an exceptionally axillary

fasciculate inflorescence, and allied in some respects to *Bernardia*, but without the anthers characteristic of that genus. One species, however, *Ricinella myrciæfolia*, Muell. Arg., must be removed to *Bernardia*, of which it has all the characters, and is indeed nearly allied to *B. Gardneri*, Muell. Arg. 2. *Leucocroton*, 2 or 3 Cuban species, quite distinct in habit and character. 3. *Chloradenia*, a single Javan species united by Mueller with *Cephalocroton*, probably on account of the inflexion of the apex of the filaments; but this inflexion is not double as in *Cephalocroton*, and the inflorescence, styles, and other characters are much nearer those of *Alchornea*; the second supposed species of *Chloradenia*, founded on the imperfectly known *Adiscus albicans* of Blume, must be a very different plant, which Zollinger was probably right in referring to *Croton*. 4. *Cœlodepas*, 3 tropical Asiatic species, rather different from each other in habit, but well characterized by the peculiar stamens. 5. *Bocquillonia*, a New-Caledonian genus of 5 or 6 species, differing from *Alchornea* chiefly in inflorescence, but also in the styles. 6. *Adenophædra*, a single Brazilian species, only known to me by Mueller's figure and description, which indicate a close connexion with *Alchornea*. 7. *Caryodendron*, Karst., in which Mueller has since recognized his *Centrodiscus* as a congener, thus forming two tropical American species evidently allied to *Alchornea*—but with the stamens inserted round a broad central disk, and the fruit large with hard thick endocarp, represented in the plate rather as opening in valves than separating into cocci. 8. *Alchornea*, a genus of which Mueller enumerates 35 species, distributed into ten sections. Of these, *Eualchornea*, with 17 American and 1 African species, *Aparithmium*, 1 American species, *Cladodes* and *Stipellaria* of five species each, all from the Old World, and *Lautembergia* and *Orfilea*, each of one Madagascar species, appear to be well established as sections of one genus. The Australian *Cœlebogyne*, which, following Mueller, I had in the 'Flora Australiensis' adopted as a section of *Alchornea*, differs so much in the female calyx and style that it might have been retained as a distinct genus. Baillon's *Wetria*, 2 species from the Malayan archipelago, and *Palissya*, 1 species from Madagascar, both with numerous stamens, reduced to sections by Mueller, will probably, when better known, be restored as independent genera as originally proposed. The section *Sidalchornea*, Muell. Arg., a single Brazilian species, proves to be identical with the species since published by Mueller as *A. pyc-*

nogyne under the section *Eualchornea*. 9. *Alchorneopsis*, 2 tropical American species or varieties, very closely resembling a true *Alchornea* of the same region, with the only ascertained difference of the development of a rudimentary pistil in the centre of the male flower. Baillon in his 'Histoire des Plantes' reduces it doubtfully to *Alchornea*; but it is scarcely safe to do so until the ripe fruit is known, as in the young state it is globular and seems very fleshy. 10. *Lepidoturus*, two African and one Madagascar species, very near *Alchornea*; but the male spikes are simple, with very prominent concave scarious bracts under the clusters, imbricate in the young state but persistent throughout the flowering, giving the spikes the aspect of catkins; whilst in *Alchornea* and its nearest allies the bracts are minute or quite inconspicuous. Mueller also describes the seeds as strophiolate in *Lepidoturus*, and without any strophiole in *Alchornea*, but this requires further verification. 11. *Conceveiba*, a tropical American genus, very well characterized both in the males and the females, if limited to the three typical species, *C. guyanensis*, *C. Hostmanni*, and *C. latifolia*. Of the others, added by Mueller, he has since correctly transferred *C. megalophylla* and *C. Martiana* to *Alchornea*; *C. africana* is a species of *Neoboutonia*; and *C. terminalis* is 12. *Gavarretia* of Baillon, consisting of two tropical American species, resembling *Conceveiba* in the very coriaceous foliage, but with neither the infloresence nor the female flowers of that genus; and the male flowers are as yet unknown. 13. *Lasiocroton*, a single Jamaican species, so closely resembling *Mallotus* in habit and character that I should have had no hesitation in reducing it to that genus were it not for its distant geographical position, accompanied by some slight differences in other respects which, if the plant were Asiatic, would be set down as specific only. 14. *Neoboutonia*, a well-defined African genus of two species, only slightly differing from each other, chiefly in indumentum, though one is entered in the 'Prodromus' as *Neoboutonia*, and the other as a species of *Conceveiba*, of which it has none of the special characters. 15. *Cœlodiscus*, 4 Indian or Malayan species, slightly differing from *Mallotus* in the broad central disk of the male flowers. 16. *Podadenia*, a Ceylon species reduced by Baillon to *Mallotus*, but sufficiently distinguished as well by the long pointed connective of the anthers as by the large fleshy indehiscent fruit, covered with peculiar stipitate glands. 17. *Trewia*, a well-known East-Indian genus of which two species

appear to have been confounded, both differing from *Mallotus* chiefly in the fruit and somewhat in habit. It is, however, by some inadvertence that both Baillon and Mueller continue to quote Gaertner's *Tetragastris* as a representation of the fruit of *Trewia*, although Kunth had long since identified it as that of *Hedwigia*. It was from a mistaken supposition that it was really that of *Trewia* that Lindley was induced, in his 'Introduction to the Natural System,' to propose it as a distinct order under the name of Trewiaceæ, a mistake which he corrected in his 'Vegetable Kingdom.' 18. *Coccoceras*, 3 Malayan species, only differing from *Mallotus* in the capsule, in which the dorsal angle of each coccus is very prominent, and in the typical species produced into a long horn-like point. 19. *Mallotus*, the *Rottlera* of Roxburgh, containing at least 70 species dispersed over the Indo-Australian region, and extending very sparingly into tropical Africa. Their distribution into sections is as yet very unsatisfactory. There is considerable diversity in their foliage and habit, as well as in some of the floral characters; but Mueller's one large and four small sections are founded chiefly on modifications of the disk and on the texture of the outer coating of the seed, which are very uncertain or unknown in the case of most species, and apparently very little in accord with other characters. A difference in the anthers, with the cells contiguous or separated by a broad or truncate connective, may be more constant and apparently corresponding with some differences in the fruit, but requires verification in a great proportion of the species. The whole genus requires a thorough revision, and the more so as there appear to be several unpublished species in our collections. The genus *Diplochlamys*, a single Malayan species, will have to be included in *Mallotus*, differing only in the number of sepals of the female flower, which is variable in the whole genus, and in this species double the usual number, which suggested the idea that half of them were in fact an involucre. There are also two or three species differing from all others in the styles united to above the middle in a slender column as in *Tragia*: they have been proposed as a distinct section, or even genus, under the name of *Stylanthus*; but this is so little in accord with the habit or other characters, that of two species known to Mueller only by their male flowers, and united in the 'Prodromus' under the name of *M. Porterianus*, one (Wall. Cat. Herb. Ind. n. 9023) proves to be a *Stylanthus*, whilst the other (Wall. *l. c.* n. 9094) is an ordinary *Mallotus* with the styles free from the base.

Two genera nearly allied to *Mallotus* form a fourth group, distinguished by the anthers, of which each cell is divided into two locelli, as in *Endospermum*, though these locelli are not separately globular as in *Bernardia* and *Hasskarlia*. In *Cleidion*, a genus of 7 species dispersed over the tropical regions of the New as well as the Old World, the 2 cells are lateral with the locelli superposed. In *Macaranga* (*Mappa* of Jussieu), a genus of about 80 species, chiefly from the Indo-Australian region, but extending on the one hand to tropical Africa, and on the other to the South-Pacific islands, the character is not quite so constant, and the locelli not quite so regular. In the great majority of species the anthers open in 4 nearly equal valves; but sometimes two of the valves are smaller, or there are only three or even two; but the genus may be more or less distinguished from *Mallotus* either by the inflorescence or by the bracts, or by some floral characters. The species are distributed into three principal groups or sections. In the typical *Macaranga* the stamens are indefinite, the anthers always 4-valved, and the pistil almost always reduced to a single carpel. In the section to which Mueller has limited the name of *Mappa*, the stamens are also indefinite, the anthers usually 4-valved, but a few 3-valved ones are occasionally mixed in with them, and the ovary is usually 2-celled, very rarely 3-celled; and in this section should be included Mueller's *Dimorphanthera*, two very dissimilar species, one of which has 3-valved anthers mixed with the 4-valved ones, whilst of the other the male flowers are unknown. The third section, *Pachystemon*, might easily be restored as a distinct genus: the inflorescence is somewhat different; there are but 1 or 2 stamens, all with 3-celled anthers; and the ovary is 4- to 6-celled, succeeded by a very flat-topped capsule: it comprises six species. *Mappa capensis*, from South Africa, transferred by Mueller to *Mallotus*, is as it were intermediate between the two genera. The inflorescence, the female monocarpellary pistil, and the fruit are quite those of *Eumacaranga*; but there are only 2 or 3 stamens, much like those of *Pachystemon*, but apparently always with 2-celled anthers.

The next group, also of only two genera, is remarkable for the large number of anthers, sometimes above a thousand, crowded on repeatedly branched filaments. 1. *Ricinus*, a single but very comprehensive genus, probably of African origin, but now established in so many tropical and subtropical countries, and varying to such a degree, that several species have been dis-

tinguished upon rather fair grounds; and 2. *Homonoia*, a well-established genus of 3 or 4 species from East India and the Archipelago.

Our last group of Acalypheæ consists of four genera, in which the male calyx is not so strictly valvate or is already open in the bud. All are from the Malayan archipelago or from Eastern Asia. They are:—1. *Cheilosa*, a single species with the calyx rather deeply divided into slightly imbricate lobes; 2. *Endospermum*, 3 or 4 species with a shortly-toothed calyx, 4-valved anthers, and a peculiar style—including *Capellenia*, very well described and figured by Teijsmann and Binnendyck in a memoir published many years since in Java, but overlooked by Miquel, and consequently by Mueller as well as by Baillon; 3. *Cephalomappa*, a single Bornean species, with remarkable capitate male flowers, recently described by Baillon; and 4. *Cladogyne*, a single imperfectly known species, which from Spanoghe's description appears to have the capitate male flowers of *Cephalomappa*, but differs from that genus in several particulars.

There remains Baillon's genus *Cocconerion*, of two New-Caledonian species, of which the female flowers alone were seen by him, and the affinity is therefore uncertain. It may belong to Acalypheæ; but the leaves are described as verticillate and the female calyx valvate, a combination otherwise unknown in apetalous Crotoneæ.

Subtribe 6. Geloniеæ. Under this name I have collected five or six genera with the very imbricate sepals and usually dense axillary inflorescence so frequent in Phyllantheæ, but with the central indefinite stamens and uniovulate ovary-cells of Crotoneæ. These genera may not be all nearly connected with each other, but could not well be placed in other subtribes without interfering too much with their tribual characters. They are:—1. *Chætocarpus*, a genus originally established for two tropical Asiatic species with globular densely echinate fruits, and well defined by several prominent characters. Since then, however, two or three tropical American species have been found to agree with them in every thing except the calyx 5-merous instead of 4-merous. They have therefore been correctly united with *Chætocarpus* by Mueller, and proposed by Baillon as a distinct section of that genus under the name of *Amanoella*. A Guiana plant of Schomburgk's appears to be specifically distinct from the Bra-

zilian ones, and remains unpublished, though Planchon long since indicated in the Hookerian Herbarium its connexion with *Chætocarpus*. 2. *Mettenia*, 2 West-Indian species, evidently very closely allied to *Chætocarpus*; but the flowers are as yet very imperfectly known, and there are some slight differences in the dehiscence of the fruit. 3. *Gelonium*, a genus of about 12 species, from tropical and southern Africa and tropical Asia, having no immediate connexion with any other one, and at once recognized by the fig-like stipules leaving an annular scar at each node, and the clusters of flowers always strictly leaf-opposed, apparently indicating the constant abortion of one leaf of each pair of opposite ones. 4. *Baliospermum*, 4 East-Indian species, running much into each other, but well defined as a genus and differing from others in this subtribe in the much looser inflorescence. 5. *Phyllobotryum*, a very imperfectly known tropical African species, described only from male specimens. Baillon appears to have found a minute very young bud in which he thought he traced a perfect one-celled ovary with parietal placentæ; but this requires further confirmation, for the habit of the plant is quite Euphorbiaceous. 6. *Erismanthus*, a Penang species with a very marked habit, but uncertain as to its affinities, the male flowers having only been seen in very young bud, and the ripe fruit being unknown. The young fruit, with the very much enlarged foliaceous calyx, is that of *Dimorphocalyx*, but the habit and inflorescence very different, and the male calyx, young as it is, evidently imbricate.

Subtribe 7. PLUKENETIEÆ. I have endeavoured to gather together under this name a number of apetalous genera with the calyx of Acalypheæ, but remarkable for the thick fleshy column or mass into which the styles are united nearly to the apex, where they form short terminal lobes—a character repeated only in a few genera of Hippomaneæ and constant in Plukenetieæ, except in a few species of *Tragia* and *Cnesmone* included in Plukenetieæ on other grounds. The subtribe consists of two very distinct groups, the first five genera being erect not much branched trees or shrubs, with the large leaves usually crowded at the ends of the stems or branches; the remaining seven, with the exception of a very few species, are either shrubby or herbaceous climbers or twiners, or herbs with short ascending stems. The genera are:— 1. *Epiprinus*, a single Malayan species remarkable for the very

much enlarged foliaceous fruiting calyx, with external glands or small accessory lobes alternating with the sepals at their base. Mueller makes a subtribe of this species, characterized by the involucrate female flower; but there must have been some confusion in his idea of this involucre. In the subtribal character he says of the female flower, "Involucrum calyciforme uniflorum," in which he seems to have had in view the large calyx, which at first might be readily taken for an involucre. In the description of the species he corrected this into "Calycis fœminei laciniæ . . . . involucrum simulantes," and, abandoning the term involucre, describes the female calyx as "calyculatus . . . . Calyculi laciniæ . . . . valide biglandulosæ, calyce breviores . . . . subdeciduæ"—a description not quite correct. These appendages are not segments of a continuous involucre, but perfectly detached and distinct from each other, and consist of one rather large gland (never two in our specimens), usually bearing a pubescent, thickish, somewhat lanceolate dorsal appendage, sometimes one fourth of the length of the flowering calyx, not one tenth of the fully developed fruiting calyx, and sometimes the gland is almost bare. These appendages appear to me, therefore, to be perfectly homologous with the glands alternating with the sepals in *Conceveiba* and a few other genera. 2. *Pycnocoma* contains four well-characterized tropical African species, to which Baillon has added four from Madagascar unknown to me, but for which Mueller has proposed a distinct section, *Wetriaria*. 3. *Ramelia*, a New-Caledonian shrub unknown to me except from Baillon's character, which seems to indicate its place in the present group. 4. *Astrococca*, two species, and 5. *Angostyles*, one species, all from North Brazil and well defined. 6. *Sphærostyles*, a Madagascar climber, which, from Baillon's character, must differ but little from *Plukenetia*, except in the calycine segments and stamens reduced to three. 7. *Plukenetia*, about 12 species, dispersed over the tropical regions of America, Africa, and Asia, but not extending to Australia. They are mostly climbers, characterized chiefly by the stylar column always fleshy, but varying from globular to long and narrow. Mueller's sections appear to require some modification. *Euplukenetia* must be limited to the original *P. volubilis*, which, besides minor characters, differs very prominently from all others by the very long narrow stylar column crowned by four radiating lobes, although Mueller characterizes the section in which he places it by the stylar column "obovoidea crassa." To

the second section, *Pterococcus*, should be referred, besides the African and Asiatic species forming Mueller's section *Hedraiostyles*, the American *P. penninervia* and *P. verrucosa*, placed in the 'Prodromus' under *Euplukenetia*. *Angostylidium* is a single African shrub, which has not the twining stems of the majority of species; and the Peruvian *Cylindrophora*, of which I have seen no specimen, must be very near it. *Fragariopsis*, a single Brazilian twiner, has been adopted both by Mueller and Baillon as a distinct genus, on account of the globular, almost fleshy receptacle of the male flower. It appears, however, to me to differ less from the typical *Plukenetiæ* than *Anabaina*, a single Brazilian species admitted as a section of *Plukenetia* by both Mueller and Baillon. Another distinctive character attributed to *Fragariopsis* is the leaf-opposed racemes; but this character is not quite constant, and occurs occasionally in other sections; nor is it strictly correct; for the insertion of the raceme is not exactly opposed to the leaf as in *Gelonium*, but usually a trifle higher up and sometimes somewhat lateral. An unpublished species gathered by Pearce at "Monterico," in South America, has the inflorescence and nearly the male flowers of *Fragariopsis*, but with a different habit, and the stylar column is that of *Pterococcus*; and Moritzi's specimens, n. 1661, from Tovar in Venezuela, represent a species with most of the characters of *Plukenetia*, but the ovary is 2-celled only, and the style or stylar column is a flat, cushion-like though still fleshy mass, shorter than the ovary itself. 8. *Acidoton*, a single Jamaican species, a loosely branched shrub, not a climber, but with the stinging hairs of the two following genera. 9. *Platygyne*, a very distinct Cuban climber, with stinging hairs. 10. *Tragia*, about 50 species, dispersed over the tropical regions of the New and the Old World, and extending beyond the tropics into North America and South Africa, all twiners or with low herbaceous ascending stems. It forms a very well defined genus, but is rather difficult to place well in the system. Its twining habit and stinging hairs would associate it with some *Plukenetiæ*, but the stylar column, though frequently well developed and somewhat fleshy, is sometimes slender or short as in some species of *Mallotus* and other Acalypheæ, with which it has evidently no very close affinity. The species are distributed in the 'Prodromus' into eleven sections, some of which require modification. Three, *Eutragia* and *Ratiga* from America and *Tagira* from the Old World, comprising the great bulk of the species, all with

triandrous male flowers, differ but little from each other; *Agirta* and *Lassia*, each containing one Madagascar species, also triandrous, are unknown to me. *Leptobotrys*, the common North-American species, is almost always diandrous. *Leucandra*, originally proposed by Klotzsch as a genus for a tetrandrous Brazilian species with ascending but not twining stems, has been extended to comprise a few other Brazilian species with the normal twining habit and 4 to 8 stamens in the male flowers. *Bia*, with 10 to 20 stamens in the males, has four South-American species, including *Leptorhachis* of Klotzsch, which in the 'Prodromus' is associated with *Ctenomeria* as a distinct genus, but restored by Mueller to *Tragia* in the 'Flora Brasiliensis.' *Ctenomeria*, a South-African twiner, also polyandrous, but very dissimilar to *Leptorhachis*, forms a distinct section of *Tragia*. *Zuckertia*, from Mexico, another polyandrous species, is unknown to me; Baillon retains it as a distinct genus. Lastly, *Seidelia* is so very different in habit and character from *Tragia* that I cannot understand the principle upon which Mueller includes it in that genus. Baillon, as already mentioned, has correctly understood its affinity to *Mercurialis* and *Adenocline*. 11. *Cnesmone*, a single tropical Asiatic tall climber, is near to but sufficiently distinct from *Tragia*, and is equally ambiguous between Plukenetieæ and Acalypheæ. 12. *Dalechampia*, about 60 species, chiefly American, but extending also into tropical Africa and Asia. The genus is perfectly well defined, but has the habit and characteristic style of Plukenetieæ, and is in some respects nearly allied to *Tragia*, though often widely distanced from it, and formerly placed in Euphorbieæ as having the flowers involucrate. To this character Mueller always attaches great importance, although the so-called involucre is often very different in homology. In this case it consists of two of the lower bracts of the short, often capitate inflorescence being much enlarged and often coloured; but even this character is not constant; for in the South-American *D. micrantha*, for which Klotzsch proposed the generic name *Rhopalostyles*, the inflorescence is looser and the lower bracts not at all or scarcely enlarged.

Subtribe 8. HIPPOMANEÆ. This is one of the most natural subtribes of Crotoneæ, generally admitted but difficult to define, and variously limited by different botanists. It was well marked out by Adrien de Jussieu as his fifth section, to which Bartling,

and after him Endlicher, gave the tribual name Hippomaneæ. Mueller adopted the name, but extended the tribe so as to contain a large number of very dissimilar genera, connected together by the sole character of having the male calyx either imbricate or not strictly valvate, distinguishing the true Hippomaneæ as a subtribe *Euhippomaneæ*. Baillon, in his 'Histoire des Plantes,' returned to the old limits, but replaced Bartling's name by that of *Excœcarieæ*, for which change he does not give any reason; and the character he gives of the series (Hist. Pl. v. 15), though applicable to many species, has far too many exceptions to be practically useful. Very precise characters it is indeed impossible to give. The principal one consists in the great reduction of the male calyx, leaving the anthers exposed in an early stage, and either cupular with a sinuate margin or with broad imbricate lobes, or reduced to three distinct scale-like sepals, or entirely wanting, and never valvate as in Acalypheæ. The male flowers are usually in catkin-like spikes or in heads; the bracts subtending the flowers have usually, but not always, a large gland on each side at the base; the styles in a few genera show the large fleshy column of Plukenetieæ, but are very variable. The normal genera, with the single flowers or small clusters subtended by small bracts usually biglandular, may be distributed into two groups—the first with indefinite stamens usually more than six, the second with one, two, or rarely three or more stamens in the male flowers, and the calyx often more reduced than in the first; to these are added three genera with very abnormal bracts.

The first group includes five genera:—1. *Mabea*, a very natural and well defined tropical American genus of about 16 species, sometimes rather difficult to distinguish from each other; the climbing habit and columnar style bring the genus very near to Plukenetieæ. 2. *Homalanthus*, an old and well-established genus of 7 or 8 species from the Malayan archipelago, tropical Australia, and the South-Pacific islands. I have already shown the impropriety of changing the name to *Carumbium*; and in the 'Flora Australiensis' I have given my reasons for following Baillon in restoring to the genus Mueller's *Wartmannia*. 3. *Pimeleodendron*, 2 or 3 species from the Malayan archipelago, united by Baillon with *Homalanthus* on account of the similarly flattened calyx; but the calyx is not quite the same, and the foliage, inflorescence, and anthers very different. The typical species forms in the 'Prodromus' a section of *Homalanthus* (*Carumbium*); but

it appears to me to be a strict congener of *Stomatocalyx*, separated by Mueller into a distinct subtribe on account of a more evident vacuum between the stamens in the centre of the male flower—a difference, if it exists, of very little importance. 4. *Senefeldera*, 4 Brazilian species forming a genus as distinct in inflorescence as in floral characters. 5. *Trisyngyne*, 2 New-Caledonian species very imperfectly known, and possibly not belonging to the order—but if really Euphorbiaceæ, probably referable to this group.

The second group includes fifteen genera:—1. *Omphalea*, contains eight species, of which seven are from tropical America and the eighth, although strictly congener, is from Madagascar. They are woody climbers with a fleshy columnar style, like *Mabea* (approaching Plukenetieæ), but very different from that genus in the peculiar stamens, the habit, and inflorescence. 2. *Ophthalmoblapton*, three or four Brazilian species, well defined both in habit and character. 3. *Hippomane*, a well-known West-Indian poisonous tree, quite distinct in habit and character, and spread over the sea-coasts of the neighbouring continent as well as of the islands themselves. Next follows a series of eleven genera united by Baillon under the name of *Excœcaria*, and certainly very nearly allied to each other, but mostly distinguished by characters of sufficient importance to allow of their separate adoption, although sometimes with limits somewhat different from those assigned to them in the 'Prodromus.' 4. *Maprounea*, a genus of two tropical American and one African species, most marked not only by their habit and peculiar inflorescence, but by the seeds, which have a broad flat or depressed surface immediately under the large fleshy strophiola, which has not been observed in any other Euphorbiaceæ. 5. *Stillingia* (including *Gymnostillingia* distinguished in the 'Prodromus' by the greater reduction or deficiency of the female perianth) is a fairly marked genus of about thirteen species, of which two are from Madagascar, one from the Pacific islands, and the remainder American, extending from South Brazil and Chile to the United States. They are certainly very near to *Sapium*; but the peculiar character pointed out by Mueller is constant: the cocci on falling away leave no central columella; but a portion of the base of the pericarp consolidated with the receptacle hardens and persists with it in the shape of three spreading points or horns. The *S. heterodoxa*, Muell. Arg., cannot well be a congener; the habit and inflorescence are quite

different, and the female plant, which could alone supply the generic character of *Stillingia*, is unknown. It is most probably a species of *Sebastiania*. 6. *Sapium*, a genus of about 25 species, from both the New and the Old World, referred by Mueller as well as Baillon to *Excœcaria*. It appears to me, however, to differ much more from that genus than does *Sebastiania*. The calyx is lobed only, not composed of distinct scales, the inflorescence is terminal and simple or, in one species, paniculate, and the capsule is more fleshy, usually opening in loculicidal valves leaving the seeds very frequently long attached to the persistent columella, or in anomalous species at length separating in indehiscent hard cocci or pyrenes, never showing the normal elastically 2-valved cocci. *Conosapium*, Muell. Arg., a Madagascar species retained in the 'Prodromus' as a separate genus on account of a trifling difference in the receptacle of the male flower and in the laterally flattened styles, is probably a true *Sapium*; but the fruit is unknown. *Sapium indicum*, though very distinct in its large fruit separating at length into hard indehiscent cocci, has the other characters of *Sapium*. *Falconeria* of Royle, also included by Mueller in *Excœcaria*, has all the characters of *Sapium*, except that the fruit has a more succulent exocarp and remains indehiscent, or the endocarp sometimes separates into distinct pyrenes. These two may be regarded as either distinct sections of *Sapium* or as separate genera. 7. *Bonania*, a Cuban genus of six species, has the broadly lobed calyx of the six preceding genera, and is in many respects very near *Sapium*, but with a peculiar habit, a slightly different dehiscence of the capsule, and the spikes generally axillary; some of the species, however, are scarcely sufficiently known to fix exactly the limits of the genus. 8. *Ditta* is a single Cuban species with the habit of *Bonania*, but only known from fruiting specimens with very resinous 2-coccous capsules; its affinities therefore are as yet very uncertain. 9. *Sebastiania*, about 40 species, all but one American, and 10. *Excœcaria*, nearly 30 described species, almost entirely from the Old World, might well have been combined in one genus, distinguished from *Sapium* in the small calyx consisting of 3 distinct scale-like sepals, and especially in the capsule (which is always the normal Euphorbiaceous one) separating into 3 elastically 2-valved cocci, leaving a central columella. The *Sebastianiæ*, however, are usually much more slender than the *Excœcariæ*, and the spikes generally, but not always, all or mostly ter-

minal or leaf-opposed, whilst in *Excœcaria* they are more generally axillary, and according to Mueller the seeds are constantly strophiolate in *Sebastiania* and without strophioles in *Excœcaria.* This character requires further investigation in many species; but in the meantime it is better to follow Mueller's distinction than to add a number of synonyms by transferring so many *Sebastianiæ* to *Excœcaria.* With regard to the subdivision of *Sebastiania,* the section *Ditrysinia,* the North-American *S. ligustrina*, with its larger less-divided calyx, connects in some measure *Sebastiania* with *Stillingia*, of which it has the habit but not the fruit, and with *Sapium.* *Microstachys* and *Eusebastiania,* as limited by Mueller, and *Sarothrostachys* and *Adenogyne* of Klotzsch, forming part of Mueller's *Gussonia,* are well-characterized sections; but I should exclude *Gymnanthes* from the genus. The species of *Excœcaria,* which I should limit to Mueller's sections 5, 6, and 7, have been much confused according to the state in which the specimens have been described. *Spirostachys* of Sonder, forming Mueller's *Excœcaria africana* and *E. melanosticta,* appears to me to be identical with the typical *E. agallocha,* with the generic character taken from the form of the male amentum when in young bud; and Baker's *Stillingia lineata*, var. *densiflora,* scarcely differs from the same *Excœcaria* in foliage only; it is very different in inflorescence &c. from the true *Stillingia lineata.* *Tænosapium* is separated in the 'Prodromus' from *Excœcaria* on account of a lateral flattening of the style, a character which can scarcely be more than specific. *Sclerocroton ellipticum*, Hochst., is certainly not *Sapium indicum*, to which Mueller refers it, but, from our specimens, is merely a different state of *Sclerocroton reticulatum,* Hochst., or *Excœcaria reticulata*, Muell. Arg. A few American species described by Mueller or by Grisebach appear further to connect *Excœcaria* with *Sebastiania*; but the specimens are as yet insufficient to exhibit all their seminal or other characters. 11. *Gymnanthes*, a genus of about ten tropical American, chiefly West-Indian species, reduced by Grisebach to *Excœcaria*, by Mueller to *Sebastiania,* appears to me to be well distinguished as originally proposed by Swartz. The male flower, as in the four next following genera, is absolutely without any perianth; or the calyx is very rarely represented by a minute scale, which may be a bract. One species (*Excœcaria polyandra*, Griseb.) has been rejected from the order by Mueller, he having once found a hermaphrodite flower. On carefully looking over the flowers of our specimens,

it would appear that what Grisebach mistook for a single polyandrous flower is in fact a cluster of diandrous ones; for the stamens are frequently very shortly connected in pairs, and here and there minute scales may be observed at their base within the cluster. The ovary described by Mueller (of which our specimens show no trace) would thus be a single female flower in the centre of the cluster or cymule. The plant appears to me to be in all respects a true *Gymnanthes*, and totally unlike any Oleacea, to which order Mueller would refer it. 12. *Actinostemon*, including *Dactylostemon*, is a tropical American, chiefly Brazilian, genus, of which 24 species have been enumerated; but some are evidently repetitions. The genus has usually polyandrous male flowers, and would technically go into our first group; but its nearest affinities are evidently with *Gymnanthes*: the principal character distinguishing it, besides the number of stamens, consists in the scarious scales which inclose the very young flower-shoots; the styles are also united at the base or higher up in a slender column. Mueller distinguishes *Dactylostemon* from *Actinostemon* in the transverse embryo; and certainly in the commonest species, *A.* (or *D.*) *verticillatus*, I have found it very oblique or nearly transverse; but Baillon insists on the uncertainty of the character, and the seeds of most species have never been observed. At any rate the genera are so absolutely undistinguishable in any other respect, that this character alone would be insufficient to keep them distinct. 13. *Adenopeltis*, a single Chilian species with the habit and peculiar fruit of *Stillingia*, from which it only differs in the absence of any male perianth. 14. *Colliguaya* comprises five extratropical South-American species, resembling *Stillingia* and *Adenopeltis* in habit, and, like the latter, without any male perianth; but the male flowers are collected in clusters as in *Gymnanthes polyandra*, and the rhachis of the cluster is adnate to the subtending bract, so that the flowers appear to be inserted on the bract. 15. *Dalembertia* is a genus of four Mexican species, distinct in habit, usually lobed leaves and pedicellate male flowers, with some other characters that I have not had the means of investigating for myself, and have been obliged to extract from Baillon's and Mueller's descriptions.

There remain three American genera, all agreeing with Hippomaneæ in their floral structure, but differing from all other Euphorbiaceæ in their bracts, and having no direct connexion with each other, each one marked by a variety of characters. They are:—

1. *Hura*: the membranous bracts, each one inclosing a single male polyandrous flower, are adnate to the rhachis all round, completely closed over the bud, bursting irregularly in the centre as the flower pushes forth. The genus comprises two or three species. 2. *Algernonia*, including *Tetraplandra*, about four Brazilian species. In this genus the amenta are narrow, the long narrow membranous bracts are adnate all round, quite closed over the bud, and burst longitudinally as the flower opens as in *Hura*, but each one covers about three superposed monandrous flowers. The supposed difference in the anthers of *Algernonia* and *Tetraplandra* arises probably from the different stages at which they are examined. In the bud they appear 2-celled only; but when they are exserted after flowering, each cell is more or less distinctly divided into 2 locelli. Our last genus, *Pera*, comprising about 20 South-American species, is very different. Two bracts are united in a globular pea-shaped involucre, perfectly inclosing the cluster of flowers when in bud, and at the time of flowering opening in a lateral slit or in two valves. These involucres are generally several together in the axils or at the nodes, sessile or pedunculate, and have often a pair of small loose bracts on the pedicel under them. The species were distributed by Klotzsch into four genera, now retained as sections with a fifth added by Mueller in the 'Flora Brasiliensis,' all with nearly the same habit, but differing in the way in which the male flowers, rudimentary ovules, or female flowers are mixed in the heads or separated. There is still some doubt as to the structure of the seeds. Klotzsch was only able to examine one, in which he found thick fleshy cotyledons without any albumen. The very numerous specimens we have are mostly in flower or bud without ripe seeds, of which I have only had three to examine: the first separated within the testa into two fleshy masses, apparently cotyledons like those figured by Klotzsch; but in the two others the fleshy masses were certainly albumen, with the normal embryo between them having very thin and broad cotyledons.

We have in our herbaria specimens of at least a dozen Euphorbiaceæ, chiefly from Beccari's and Maingay's collections, with two or three African ones, which I am unable to refer to any known genera, but which, owing to our only having one sex, it would not be prudent to publish as new genera.

IV. ORIGIN AND GEOGRAPHICAL DISTRIBUTION.

Among Dicotyledons, Euphorbiaceæ stand fourth in point of number:—Compositæ being first, with (in round numbers) 10,000 species in 800 genera; next, Leguminosæ, under 7000 species in 400 genera; thirdly, Rubiaceæ, above 4000 species and rather under 350 genera; Euphorbiaceæ having above 3000 species in 200 genera. Further discoveries are likely to raise the numbers of the last two of these Orders more in proportion than those of the first two, but yet not sufficiently to alter their relative position. Labiatæ, which follows as the fifth, have under 3000 species in 140 genera; and their geographical relations are not such as to promise so many additions as in the case of Rubiaceæ and Euphorbiaceæ. The relative positions of the five orders may therefore be regarded as definitively fixed. In definitiveness of circumscription, Euphorbiaceæ rank with Compositæ and Leguminosæ. Each of these three Orders has become perfectly isolated, without any intermediate forms remaining to bridge over the interval which separates them from the surrounding ones—having no trace of those gradual modifications which so closely connect Rubiaceæ on the one hand with Caprifoliaceæ, and through them with Cornaceæ, and on the other, with Loganiaceæ, and through them with the great mass of dicarpellary gamopetalous orders, or of those which allow of no very definite line being drawn between Labiatæ and Verbenaceæ. Euphorbiaceæ, therefore, like each of the two above-named primary Orders, can be treated as a definite whole; and it is thus that the study of their origin and geographical distribution acquires a peculiar interest.

In investigating the origin of Euphorbiaceæ, the geological record is unfortunately of no assistance. The generally herbaceous genera of the northern temperate regions are not such as to leave any permanent traces of their existence; and the leaves of arborescent Euphorbiaceæ have, in general, no peculiarity by which they can be distinguished from those of other Orders; besides that, the palæontology of those tropical regions where the majority of them are to be found is but little known, and I can find no authentic record of a single fossil Euphorbiacea. Ettingshausen has indeed referred about a dozen impressions of leaves to various genera of that Order; but Schimper (Paléontologie Végétale, iii. 290) doubts the identification of most of them; and not one is positive enough to found any such conclusion as that there was

ever a *Baloghia*, an *Adenopeltis*, or a *Homalanthus* in Bohemia, contrary to all presumptive evidncee. Not a single fruit elastically tricoccous has to my knowledge been found amongst these remains; and if there were, it would be hard to distinguish their fossil impressions from those of some Rutaceæ or Simarubeæ. Origin, therefore, can only be deduced conjecturally from peculiarities in the modern geographical distribution.

The first and most striking feature is evidently the tropical nature of the Order. The few extratropical tribes or genera (except possibly Buxeæ) would appear, as in the case of Mimoseæ, to have been independently derived from tropical ones, although further differentiated and multiplied in temperate regions. We observe no evidences of ancient communication between distant extratropical regions (such as that between South Africa and Australia, exemplified in Restiaceæ, Proteaceæ, *Helichrysum*, Diosmeæ, etc.), no western Old-World connexion of the temperate floras (as exhibited between western South Africa and western Europe in the case of Gesniteæ, *Erica, Lobelia*, etc.), no West-American connexion between California and Chile, no group common to Mexico, extratropical South America, and South Africa—the only approach to such a connexion being that of *Dysopsis* with the Stenolobeæ, to which I shall presently recur; and the northern extratropical connexion is very rare. On the other hand, the connecting links between the extratropical tribes and the tropical ones will generally be found within the tropics, as I shall endeavour to show when considering the geography of special genera.

If there are strong arguments in favour of the tropical origin of the order, the question of what region within the tropics gave birth to it is not so easily solved. Excluding the southern extratropical Stenolobeæ, all the five tribes are common to the New and the Old World; about 110 genera, or marked sections, are exclusively Old World and mostly tropical, from various parts of what has been supposed to be a once continuous tract of territory from tropical Africa to the Malayan archipelago and South-Pacific islands; about 60 genera are exclusively American, the tropical ones mostly limited to the eastern region from South Brazil to the West Indies and Central America. About 17 are common to both continents: of these 8 are chiefly American with American relations, 2 are represented in the two continents by distinct but closely allied sections, 1 is an Old-World genus but slightly represented in America, the remaining 5 or 6 may be

considered as pretty generally belonging to both. When it is further considered that the great majority of isolated or remotely connected monotypic or small genera, apparently remains of ancient expiring types, belong to the Old World, although a few such may be also found in America, and that the tendency to a multiplication of species is greater in America than in the Old World, we may be led to conjecture that the most ancient home of the Order was in the Old World, but that several of the principal forms were differentiated and widely spread before that remote period when the present impassable barriers opposed by the Atlantic and Pacific did not exist, or were crossed over in some manner of which no plausible explanation has been suggested. It would also appear that interchange of forms between the principal Old-World centres of differentiation, tropical Africa and Madagascar on the one hand, the Malayan and South-Pacific islands on the other, continued long after the interposition of the obstacles preventing the spread of the new American forms. In elucidation of these conjectures it may be well to go through seriatim the different tribes and principal genera with reference to their actual distribution, premising, however, that, owing to our imperfect acquaintance with a large number of tropical frutescent or arborescent genera, the best tests of genetic history, much may have to be modified hereafter, both in the data given and in the conclusions drawn from them.

1. Euphorbieæ.

The two small genera *Anthostema* and *Synadenium* probably represent a very early stage of the tribe—that is, a separation from the common stock before the involucre had become so definitively consolidated and the perianth so completely annihilated as is uniformly the case in *Euphorbia*. They are both African, one only extending into Madagascar; and both are limited to two or three species, neither of them very common, nor showing much variation—indications rather of expiring than of progressive races. *Calycopeplus*, another genus of two or three species only, is an Australian offset, allied to the above two ancient African genera, and probably differentiated at a similar remote period: the structure of the flower-head is much like that of *Synadenium*, except that the perianths are perceptibly developed, and the involucral glands less so; and in adaptive characters it has assumed a habit not uncommon in Australia. This genus and the *Euphor-*

bia eremophila may be cited as instances of that apparently very ancient but long-interrupted connexion referred to in my Notes on Compositæ, p. 553.

The great genus *Euphorbia*, when it first spread into America, must have already acquired the remarkable fixity in the essential characters of the flower-head, and have already proceeded to some further differentiation continued in different directions in the two continents. Besides the common section *Anisophyllum*, to which I shall presently recur, we have three great groups, chiefly characterized in the Old World and scarcely known in tropical America:—1. *Eremophyton*, perhaps the oldest, comprising about seven tropical African or West-Asiatic species, and one Australian offset (the above-mentioned *E. eremophila*), with a dichotomous or irregular ramification, without having acquired any of the peculiarities distinguishing the other sections. 2. *Euphorbium*, about a hundred species, more or less succulent and leafless (an adaptive character, the probable result of their spread over the succulent-bearing regions of the Old World), not extending north of Africa, but abundant in southern as well as in some parts of tropical Africa, and represented (in its subsection *Tirucalli* including *Arthrothamnos*) by two West-Indian and perhaps by one North-Chilian species. And 3. *Tithymalus*, with leafy stems and umbellate upper flowering branches—a vast group which appears to have originated in some part of the Mediterranean region, where many of its races now luxuriate in the highest state of prosperity and variability, and whence it has spread over Europe and a great part of Asia, and may have reached America by a route north of the tropics. Out of the 310 admitted species, 48 are American and almost all northern and extratropical, about 12 are extratropical South-African; the remaining 250 belong to the Mediterranean and north temperate Old-World regions, or only reach the tropics in mountain regions north of the equator.

In America the genus has taken a different course. *Eremophyton* is there replaced by *Adenopetalum*, a series of about seventy species, exceedingly diversified in habit, some not unlike corresponding Old-World species of *Eremophyton* or even of *Euphorbium*, some with a habit unknown in the Old World, and all assuming a specially American character, the development of a petal-like appendage on the back of the involucral glands. Again, *Poinsettia* is another specially American divergence from the primitive type. The involucre remains without petal-like appen-

dages, but becomes more and more oblique, with unequal glands, those on one side often much reduced or even deficient. The extreme forms of this section almost pass into the peculiarly American genus *Pedilanthus*, consisting of about fifteen species, the most divergent of which may be taken as the last stage of evolution in this direction. These species do not appear to be very abundant in varieties or in individuals; but they are not marked by any very prominent distinctive characters, they leave no great gaps between them, and show no approach to any other old group or genus, thus giving no evidences of a comparatively remote antiquity.

There remains the very natural and well-characterized section *Anisophyllum*, of which Boissier enumerates 176 species, a number which might without violence be extended to above 200 or reduced to little more than 100, so great is the variability of many of them. Collectively they are cosmopolitan; and individually many are very widely spread; at least three (*E. pilulifera*, *E. serpens*, and *E. thymifolia*) are nearly equally spread over the New and the Old World; and they afford very few data on which to found conjectures as to the origin and chief centres of the tribe. The species belong almost exclusively to that category of annuals or plants of short duration which ripen their seeds in great profusion in the season which gave them birth, or at the worst have but one dead season to pass through before maturity. Their chances of acclimatization (*i. e.* of producing races better suited to the soil, climate, or social conditions of the territory they have invaded) are thus infinitely greater than in the case of trees, shrubs, or long-lived perennials, which have in their primitive state to bear through a number of varied seasons before they are ready for reproduction and the chances of variation. On the other hand, these annuals are exposed to chances of destruction in the successive stages of seed, seedling, and plant they have to go through every year, very numerous in comparison with those which affect the arborescent, frutescent, or perennial plant, which, having once established its root or stock firmly in the ground is not to be annihilated by injuries to its aerial stem or foliage. Such annuals have, in fact, often been known to have extended, contracted, or changed their areas with great rapidity; and in their case, therefore, present distribution gives but very little clue to their ancient history. In the case of *Anisophyllum*, moreover, many of them are maritime plants or weeds of cultivation, both of these classes enjoying

special means of dispersion. Of the 176 species, 105 are given as exclusively American, 68 as confined to the Old World, and only 3 as amphigeous : there are, however, some others so closely representative of each other in the two continents as to be considered identical by some botanists. The preponderance is American ; and one of the almost constant characters, the petal-like appendages to the involucral glands, is, as we have seen in other sections, specially American. It is, however, well marked in many Old-World (especially Australian) species of limited areas. Again, when we come to consider the connexion of the tribe with other groups of the genus, we find evidence on both sides. Of the species where there is no petaloid appendage, five are maritime plants of the Pacific islands, and a sixth is the amphigeous *E. pilulifera*. The few *Anisophylla* which assume the habit of other tribes are American; and some American *Adenopetala* (*Zygophyllidia*) approach very near to *Anisophyllum* in all respects. The probability is that the type was very early established in both continents, that it became more readily developed in America than in the Old World, and that there have frequently been casual interchange of species between the two, many of them having long continued and still continuing to produce local varieties to be gradually differentiated into species.

2. Stenolobeæ.

The eminently geographical character of the small tribe Stenolobeæ has been already exhibited under the head of systematic arrangement (above, p. 204). Of the 66 species limited to Australia, only three are tropical, including a common weed, *Poranthera microphylla*, spread all over the territory, but not extending beyond it; and the Chilian *Dysopsis* is the only extra-Australian species to be added to the 66. Whether the constancy of the marked exceptional but essential character derived from the embryo can be taken as absolute proof of community of origin, or whether it may be supposed that Euphorbiaceæ of different types, when establishing themselves in Australia, assumed one special character unknown elsewhere, cannot now be decided. It is certain that some Stenolobeæ show in other respects some slight affinities with Phyllantheæ, whilst others tend rather towards Crotoneæ ; but no one genus is closely allied to any one in either of these tribes; and it may well be generally conjectured that

where various races are descended from a single one, all may in their further differentiation show variations in some characters, whilst one only may assume some special character, and that this may be continued through a number of secondary races, which may in other respects vary in the same manner as the descendants of such primary races as had not assumed the special character.

The fact above referred to, that the nearest approach to the special character of Stenolobeæ has been observed in the extra-tropical South-African genera *Adenocline* and *Seidelia*, is not sufficiently definite to afford any speculations as to derivation unsupported by other data, no close connexion between extra-tropical South-African and Australian Euphorbiaceæ being on record.

3. Buxeæ.

Here, as in Stenolobeæ, the constancy of a specially exceptional but essential character seems to indicate a community of origin in plants otherwise very different in structure; but that community must have been exceedingly remote. The genera are few, widely separate, very distinct in character, and, with some exceptions in *Buxus* itself, consisting of solitary or few very distinct species of very limited areas—all evidences of very ancient but expiring races. All have a northern character, no trace of them appearing south of the tropics. *Buxus*, the only genus with widely spread variable species, and thus still in a flourishing state, may, however, be as ancient as any of them, and possibly the nearest to the common parent of the tribe. It must have existed very nearly in its present form at that very remote period when the warmer regions of the Old and the New World were in connexion or communication. In the former it has left distinct species of limited areas in east tropical Africa and Madagascar, and perhaps thence or from further north may have spread in equally remote times over the northern hemisphere in widely extended and variable forms. In America it has assumed a slightly (but very slightly) different form, and is now limited, in a small number of species, to the West Indies, without any evidence of its having ever extended into North America, or having travelled by that route from the Old World. *Sarcococca*, in some respects very near *Buxus*, yet separated from it by a well-marked gap, is still flourishing in the mountains of tropical Asia, and may have formerly extended thence northward, becoming modified into the Japanese

Pachysandra, and further on into the very distinct North-American species of that genus. The other two genera of Buxeæ, the monotypic Californian *Simmondsia* and the tropical Andine *Styloceras* with three very distinct species, are so completely detached and of such limited areas as to afford us no grounds for forming any but the wildest guesses as to their early history, beyond the belief in their remote antiquity.

4. Phyllantheæ, Galearieæ, and Crotoneæ.

There is not sufficient distinctness in these three tribes, nor sufficient unity in each, to warrant us in considering them as primary branches of one stock; for many an early-differentiated race may have been the common parent of genera now technically separated in the two great tribes Phyllantheæ and Crotoneæ. In considering their geographical distribution, we must regard them all as one tribe, to which may be applied the general views given above of the whole Order, and for further details take successively:—

(1) The genera now existing in the two continents in identical or nearly allied groups of species.

(2) The races represented in the two continents by nearly allied but perfectly distinct genera.

(3) The genera absolutely restricted either to the New or to the Old World, without any near connexions in the other.

It will be observed that for this geographical review, I have thought it necessary occasionally to assign different limits to the genera, from those given to them in the systematic arrangement for practical use. I would also note that the number of species assigned to each genus is often approximative only and sometimes necessarily uncertain, and even the number of genera sometimes indefinite, owing to our imperfect knowledge of so large a number of tropical Euphorbiaceæ.

1. *Genera common to the New and the Old World.*

Phyllanthus, taken in its typical form common to the two continents, must be considered as including *Securinega*, which is a purely artificial genus, and excluding *Glochidion* and *Synostemon*, which may be considered as primary deviations from the type. This typical *Phyllanthus* includes seven of the sections into which the genus may be fairly divided, of which two, *Cicca* and *Euphyllanthus* (including *Paraphyllanthus*), are common to the two continents, with about 114 American and 108 Old-World species,

besides the *P. Niruri*, a tropical annual ubiquitous weed. These two sections have each of them two or three species with the rudimentary pistil characteristic of *Securinega*. The general character of the widely dispersed variable species shows no marked difference in the two continents; and there are in both continents species distinct in character and of limited area; and among these there are several that show an affinity between the Mexicano-Cuban and the Mascarene regions. The other five sections of typical *Phyllanthus* are *Xylophylla*, exclusively American, with 11 species, and *Kirganelia*, *Emblica*, *Emblicastrum*, and *Reidia*, about 50 species, all limited to the Old World and rather more Asiatic and eastern than African. In what may be considered as primary deviations from the type in different directions, we have only one American group, *Williamia*, with 3 Cuban species; four Asiatic and African, *Glochidium*, *Sauropus*, *Cluytiandra*, and *Agyneia*, about 140 species; and one in Australia, *Synostemon*, with 12 species.

Andrachne can scarcely be considered as more than a somewhat further deviation from the typical *Phyllanthus*, chiefly in the development of small scale-like petals; it has also a less tropical character, extending into temperate regions in different directions, but always in rather different forms, the several sections corresponding generally (barring the petals) as much with different species of *Phyllanthus* as with each other. The normal form *Eraclissa*, 3 species, has its chief home in the east Mediterranean and Arabic regions. The Asiatic *Arachne* (*Leptopus*), 4 species, the North-American *Lepidanthus* and the South-African *Pseudophyllanthus*, both monotypic, are so far independent of each other as to have been treated by some botanists as distinct genera. The Peruvian *Phyllanthidia* is as yet doubtful.

Savia, with 4 West-Indian and 6 Mascarene species, must also be taken as an early petaliferous offset of the *Phyllanthus* stock, or perhaps as two contemporaneous offsets; for the differentiation of the West-Indian species with the small scale-like petals of other Phyllantheous genera, and of the Mascarene species with the fully developed petals of Crotoneæ, may have been quite independent of each other. There are no other American Euphorbiaceæ that can be considered as deviations from the *Phyllanthus* stock; but in the Old World there are:—*Fluggea*, with 6 species from Africa as well as from Asia and Australia; *Breynia*, 12 species from the Indo-Australian region; *Leptonema*, 1 Mascarene species; and *Neoræpera*, 2 Australian species.

From the above data we may conjecture that *Phyllanthus* in its general sense had its most ancient centre in the African or Mascarene region, spreading very early eastward over the Indo-Australian region and westward into tropical America, in both of which it has since prospered and divided more than in Africa itself, and more in the Indo-Australian than in the American region.

The distribution of the two great amphigeous petaliferous genera is somewhat different. They are eminently American, the evidence of African origin much slighter, though perhaps still traceable. *Jatropha* especially, with 68 species, has only about 15 in the Old World, of which about a dozen are African and 2 Asiatic, besides the ubiquitous *J. Curcas*. The African ones belong chiefly to the section *Adenoropium*, with free petals; but in that section they present a few distinct forms extending southwards beyond the tropics to the Cape itself; there are also two or three of the east tropical African species that acquire the adaptive character of succulent, sometimes aculeate branches, and reduced leaves, peculiar to succulent regions. The typical *Curcas* is now widely spread over the tropical regions of the New and the Old World, chiefly near the sea; and Indian botanists have no doubt of its being really wild at least in the Peninsula. Several American stations are given by collectors with doubts of its being indigenous; but in most cases it is sent as really American. The only other species, however, of the same subsection, *J. Wightiana*, Muell. Arg., is from the Indian peninsula. The other subsections of *Curcas*, *Loureira* and *Mocinna*, are American, and present some very distinct species of limited areas from the Mexicano-Cuban region, some of them of a succulent or aculeate character; and to these the Cuban aculeate *Acidocroton* is so nearly allied that it might almost be considered a congener. The American species of the section *Adenoropium* and the species of the exclusively American and very distinct section *Cnidoscolus* are mostly wide-spread and variable. With regard to the connexions of the aggregate genus, there are none very close; and of more divergent allied genera there are but few. None are known in Africa. In eastern South America *Hevea* and its allies may be in some measure connected, and *Manihot* may possibly be a derivative, though all connexion is now completely severed. Westward *Aleurites* may be one of the nearest relatives to *Jatropha*; its two well-known species are natives of the South-Pacific islands

and extreme east of tropical Asia; but in Mexico and western South America there are two species which, as far as can be judged by male specimens, belong to the same genus. It would seem, therefore, that *Jatropha*, in its collective sense, was from a very remote period in Africa, in eastern Asia, and in America, spreading and diverging very much in the latter region, less so in Africa, and very little in Asia.

The vast petaliferous genus *Croton* must include for our present purpose its three small offsets *Julocroton*, *Crotonopsis*, and *Eremocarpus*. It is chiefly American, but is also generally spread over the tropical regions of the globe. Out of about 500 species, not quite 100 are recorded from the Old World, where they extend all the way from Africa to Australia and the South-Pacific islands. Of some twenty principal groups into which the genus might be divided, none are peculiar to the Old World, and three only are there represented (*Eluteria*, *Eutropia*, and *Tiglium*), none of them much marked in character. The remaining seventeen are exclusively American, mostly tropical, but with a few offsets beyond the tropics both northward and southward, and many of them much more divergent from the common type than any of the Old-World forms. These divergent forms, however, are aberrations in various directions, not approaches to or connecting-links with other genera. The various sections and subsections hitherto proposed are often so very technical and so little in accord with natural affinities that, until they have been thoroughly revised, it would be very unsatisfactory to enter into details as to their geographical distribution. As a whole the genus stands alone. As far as my observation goes, I can point out no other American genus showing any connexion with it, and no near one in the Old World, the least distant being perhaps three small apetalous genera, *Cephalocroton* in Africa, *Adenochlæna* in Asia, and *Adriania* in Australia. It is not impossible, therefore, that *Croton* may be of African, or rather of Africano-Australian origin, but spread in very remote times over the general Euphorbiaceous areas, becoming in subsequent times comparatively little extended or varied in the Old World, but greatly prospering in America into very numerous varied and ever-varying forms, the most divergent in geographical area—the extratropical (northern and southern) being also the most divergent from the parent stock in systematic character.

Acalypha is generally spread over the tropical regions of the

New and the Old World, without any special character in either, and the American preponderance much slighter than in *Jatropha* or *Croton*. Out of 220 species, 135 are American and 85 from the Old World, abundant in Africa, Asia, Australia, and the South Pacific, as well as in the whole of tropical America, spreading beyond the tropics southward in Africa to the Cape, and northward in America to the United States. Much as the species differ in habit, foliage, and inflorescence, they do not appear susceptible of distribution into sections well marked either systematically or geographically. The most distinct group, *Linostachys*, has 6 American and 1 Old-World species. Some minor groups may have a more local character, but have not been worked out with a view to any but technical distinctions for practical purposes. A few rather more divergent forms among the American ones show no approach to other genera. *Acalypha*, if we include *Mareya*, is as distinct and isolated a group as *Jatropha* or *Croton*—this *Mareya*, two African species first published as *Acalyphæ*, being the only form showing some approach towards other Old-World genera of the same subtribe.

Alchornea, in its most natural limits, might, as proposed by Baillon, include *Alchorneopsis* and *Lepidoturus*, but ought, I think, to exclude *Cœlebogyne*, and perhaps also *Wetria* and *Palissya*, which are scarcely yet sufficiently known. Thus restricted, *Alchornea*, with nearly the same general range as *Acalypha*, is nevertheless much more geographically divided; for the species of each country are sufficiently characterized for them to have been proposed as distinct genera. The principal section, *Eualchornea*, including *Alchorneopsis*, has 17 American species with 1 African one of the American type. *Cladodes*, otherwise the nearest representative in the Old World, but quite distinct, has 5 species African and Asiatic. Rather more diverging groups or species are:—*Aparisthmnium*, 1 American species; *Stipellaria*, 5 East-Asiatic and South-Pacific species; *Lepidoturus*, 3 African or Mascarene species; and *Lautembergia* and *Orfilea*, both monotypic, from Madagascar. *Cœlebogyne*, 1 or 2 Australian species, and *Adenophædra*, 1 Brazilian species, appear to be still more divergent; and there are a few genera of limited area, both in the New and the Old World, especially in the latter, which are not too far distant to supply some connexion with the principal Old-World genera of Acalypheæ, *Mallotus* and its allies.

Cleidion, if we exclude *C. ulmifolium* (which appears to me

much better placed in *Macaranga*) and possibly the very dissimilar *C. verticillatum*, is a natural and well-characterized genus of few widely dispersed species. We have 3 or 4 American and 8 or 9 Old-World species, viz. *C. tricoccum* from Brazil, 2 (of which one unpublished) from Peru, and possibly 1 from Central America, 1 (or perhaps 2) from tropical Africa, 1 from tropical Asia, 1 from the Fiji Islands, and about 6 from New Caledonia. The nearest affinities of the genus appear to be with the Old-World *Mallotus* and *Macaranga*.

Chætocarpus, which should probably include *Mettenia*, is a very distinct genus, with an unusual geographical range: 4 or 5 species (if we include *Mettenia*) are tropical American; and 2, differing only by a very unimportant common character from the American ones, are Asiatic, ranging from Ceylon and the Peninsula to the Malayan archipelago; and there are no African affinities, unless we seek them in some genera of Phyllantheæ, where one would be tempted to place *Chætocarpus* were it not for the uniovulate cells of its ovary.

Plukenetia, *Dalechampia*, aud *Tragia* (three genera evidently allied to each other) have also a nearly similar geographical range over the New and the Old World, with more or less of an American preponderance, the first two having only a very few African or Asiatic species, *Tragia* more equally divided and extended. *Plukenetia*, with 8 American and 5 Old-World species, has been divided into several sections or separate species considered distinct enough to have substantive names. The principal section *Pterococcus* has 2 American, 2 African, and 1 Asiatic species; the other sections are all monotypic—*Euplukenetia*, *Cylindrophora*, *Fragariopsis*, and *Anabaina* in America, *Angostylidium* in Africa, and probably *Sphærostylis* in Madagascar, also two perhaps rather more divergent unpublished American species. All are confined to the tropics. *Tragia* has about 50 species nearly equally divided between the New and the Old World, one, *T. volubilis*, being common to the two. The genus has not yet been divided into good natural sections, although a few American or Mascarene species have been singly, or almost singly, separated from the mass upon characters of minor importance. The species are mostly tropical, extending, however, southward in Africa to the Cape, and northward in America to the United States; they are numerous in America and Africa, few in Asia, and only one is in Australia. Among the nearest allies of the genus, independently

of *Dalechampia*, may be mentioned *Acidoton* and *Platygyne* in the West Indies, and, diverging in a very different direction, *Cnesmone* in Asia, all three genera monotypic. *Dalechampia*, out of about 60 species, has only 10 in the Old World, chiefly Mascarene, but 2 or 3 in Africa, and as many in Asia, besides the *D. scandens* common to both continents; there are none in Australia. The genus extends south of the tropics to the Cape in Africa, but nowhere in the north beyond the tropics. The genus has no divisions marked in character except the two small sections *Cremophyllum* and *Rhopalostyles*, both American. There are no genera nearer allied to it than *Tragia*.

The subtribe *Hippomaneæ* is a natural one, and might almost be treated of collectively as a large generally distributed group, with a great American preponderance. It is, however, not so uniform nor so completely isolated as the Eucrotoneæ. We have first three very distinct genera, almost as much connected with Plukenetieæ as with the typical Hippomaneæ, viz.:—*Mabea*, about 16 species from tropical America; *Ophthalmoblapton*, 3 or 4 Brazilian species; and *Omphalea*, 7 species from tropical America and 1 from Madagascar. We have then a series of 16 genera, all so closely allied as to be sometimes regarded as sections of one genus, but which have all distinctive characters of some importance, except perhaps those which separate *Sebastiania* and *Excœcaria*. Taking them, therefore, as we have adopted them for the Genera, there is only one that is generally spread over the New and the Old World, *Sapium*, with 25 species, of which 14 are American, with but little divergence of specific character, 11 are dispersed over tropical Africa and Asia, but do not extend to Australia. Two of these at least are much more marked than the American ones, and scarcely congeners, though there is otherwise no general difference between the species of the two continents. *Sebastiania*, with about 40 American species, and *Excœcaria*, between 20 and 30 Old-World species extending from tropical Africa to Australia and the Archipelago, are at least representative genera. They are all tropical except one species from the Southern United States of America. The American *Sebastianiæ* form two or three rather distinct sectional groups; and one species, closely allied to some of the American ones, but perhaps really distinct, is in the Old World a tropical weed of cultivation from Africa to Australia. The Old-World *Excœcariæ* have also one or two rather distinct forms; and there are a few West-Indian,

and perhaps a Brazilian, not yet very perfectly known species which seem to be as near to *Excœcaria* as to *Sebastiania*. *Maprounea* has 2 tropical American and 1 tropical African species. *Stillingia* has 11 American species, 1 in Madagascar, and 1 in the South-Pacific islands. The American ones are not limited to the tropics, extending northward into the United States and southward to the Argentine States; and the closely allied *Adenopeltis*, 1 species, and *Colliguaia*, 5 species, are all extratropical South-American. Of the remaining genera of typical Hippomaneæ, two only are peculiar to the Old-World, *Homalanthus* and *Pimelodendron*, containing between them about 10 species; and seven with about 50 species are tropical American, viz.:—*Senefeldera*, 4 species, and *Actinostemon*, 24 species, from South America, chiefly Brazil; *Hippomane*, 1 maritime species from the West Indies and neighbouring coasts; *Ditta*, 1 species, *Bonania* 6 species, and *Gymnanthes*, 10 species, all from the West Indies, but one or two of *Gymnanthes* extending into South America; and *Dalembertia*, 4 Mexican species. These Hippomaneæ have thus less of the African or Mascarene character about them than any other one of the widely spread groups; their early differentiation must have taken place chiefly in America and, to a less extent, in the eastern rather than in the western portion of the great Africano-Australian region. The three very distinct genera placed at the end of Hippomaneæ—*Hura*, 2 or 3 species, *Algernonia*, 4 species, and *Pera*, about 20 species—are all tropical American.

Four American genera or marked sections, *Amanoa*, *Caperonia*, *Eualchornea*, and *Maprounea*, all abundant chiefly in east tropical America, are represented each by one distinct species in west tropical Africa, which suggests the idea that the latter may in ancient times have been in some manner derived from America, rather than that they are remains of a parent type dating from before the disruption of the ancient communication.

There are very few *species* of Euphorbiaceæ common to the tropical regions of the two great continents; and these are in some cases so generally diffused, that it is difficult to say which was their original country, or how ancient must have been their dispersion. These are:—

(1) Weeds of cultivation: *Euphorbia pilulifera*, *E. thymifolia* (*E. serpens*?), *Phyllanthus Niruri*, and *Croton lobatus*.

(2) Herbaceous twiners of ready dispersion: *Tragia volubilis* and *Dalechampia scandens*.

(3) Widely cultivated plants: *Phyllanthus distichus, Jatropha Curcas, Ricinus communis,* and *Hura crepitans.*

2. *Representative Genera in the New and the Old World.*

The following genera are, as it were, representatives of each other in the two continents. Although well distinguished by positive characters, each one is as near as, or generally nearer to, its representative in the other continent than to any other genus in its own region.

AMERICA.	OLD WORLD.
Amanoa, 5 species, tropical, besides one true *Amanoa* in Africa.	*Cleistanthus,* 22 species, from Africa to Australia and passing through *Bridelia* into *Phyllanthus.*
Discocarpus, 3 species, tropical.	*Lachnostylis,* 1 species, extratropical South Africa.
Drypetes, 9 species, tropical and northern subtropical.	*Cyclostemon,* 18 species, tropical Africa and Asia; and *Hemicyclia* 9 species, Indo-Australian region.
Hieronyma, 8 to 10 species, tropical.	*Mæsobotrya,* 1 tropical African species, connecting *Hieronyma* with the Old-World *Antidesma* and its allies.
Richeria, 3 species, tropical.	*Thecacoris,* 4 species, tropical Africa and Madagascar, connecting *Richeria* with the Old-World *Antidesma* and its allies.

All the above appear to be much more isolated in the New than in the Old World, thus favouring the theory of their ancient African origin.

3. *Genera peculiar to each Continent, without near Representatives in the other.*

(1) *America.*—In the following enumeration I distinguish as the Brazilian region the whole of tropical South America east of the Andes, including Guiana; and the West-Indian includes sometimes the maritime districts of Columbia and Central America, though the peculiar genera are usually almost limited to Cuba and Jamaica. The peculiar American genera of Eucrotoneæ and Hippomaneæ, and some others already noticed, are not here repeated.

Piranhea.	1 species.	Brazilian region.
Æxtoxicon.	1 species.	Chili.
Pogonophora.	1 species.	Brazilian region.
Avellanita.	1 species.	Chili (connected with *Aleurites*?).

Tetrorchidium.	4 species.	Brazilian region.
Cunuria.	2 species.	Brazilian region.
Micrandra.	2 species.	Brazilian region.
Hevea.	9 species.	Brazilian region.
Joannesia.	1 species.	Brazilian region.
Garcia.	1 species.	West-Indian region.
Pausandra.	1 species.	Brazilian region.
Sagotia.	1 species.	Brazilian region.
Argithamnia.	37 species.	From Chili and Buenos Ayres, over the Brazilian and West-Indian regions, to Mexico and the Southern United States.
Caperonia.	19 species.	Brazilian and West-Indian regions.
Pseudocroton.	1 species.	West Indies.
Manihot.	80 species.	Brazilian region.
Pachystroma.	1 species.	Brazilian region.
Bernardia.	24 species.	Brazilian and West-Indian regions.
Adelia.	7 species.	West Indies.
Leucocroton.	2 or 3 species.	West Indies.
Caryodendron.	2 species.	Brazilian region.
Conceveiba.	3 species.	Brazilian region.
Gavarretia.	1 species.	Brazilian region.
Lasiocroton.	1 species.	West Indies (connected with the Asiatic *Mallotus*?).
Astrococcus.	1 species.	Brazilian region.
Angostyles.	1 species.	Brazilian region.

It will be observed that these genera are mostly perfectly detached, neither forming connecting-links between any two genera nor passing gradually into any other one. Two, *Avellanita* and *Lasiocroton*, might perhaps be regarded as representatives of Old-World genera. *Cunuria*, *Micrandra*, *Hevea*, and *Joannesia* may be to a certain degree related to each other; so also *Bernardia* and *Adelia*; and *Manihot*, though quite isolated, might be regarded in some measure as standing between *Croton* and *Jatropha*.

(2) *Old World.*—In the following enumeration I include in the Africano-Australian region the whole of tropical Africa and Asia, the Mascarene islands, the Malayan archipelago, tropical Australia, and the South-Pacific islands. I distinguish as the Indo-Australian region the same area to the exclusion of tropical Africa and Madagascar; tropical Asia includes the Malayan archipelago; and the Malayan region includes Malacca as well as the Archipelago. The list, like the preceding American list, does not

include the Hippomaneæ nor the genera endemic in Madagascar, New Caledonia, or Australia mentioned at the end.

Bridelia.	25 species.	Africano-Australian region.
Actephila.	10 species.	Indo-Australian region.
Fluggea.	6 species.	Africano-Australian region.
Breynia.	12 species.	Indo-Australian region.
Putranjiva.	2 species.	East India.
Choriophyllum.	1 species.	Malayan region.
Toxicodendron.	2 species.	South Africa.
Mischodon.	1 species.	Ceylon.
Oldfieldia.	1 species.	Tropical Africa.
Bischofia.	1 species.	Tropical Asia and South-Pacific islands.
Uapaca.	7 species.	Tropical Africa and Madagascar.
Aporosa.	30 species.	Tropical Asia.
Daphniphyllum.	11 species.	Tropical and eastern subtropical Asia.
Baccaurea.	33 species.	Tropical Asia and South-Pacific islands.
Antidesma.	60 species.	Africano-Australian region.
Hymenocardia.	5 species.	Tropical Africa and Asia.
Cyathogyne.	1 species.	Tropical Africa.
Dicœlia.	1 species.	Malayan region.
Galearia.	12 species.	Malayan region.
Microdesmis.	4 species.	Tropical Africa and Asia.
Elateriospermum.	1 species.	Malayan region.
Tritaxis.	3 species.	Tropical Asia.
Givotia.	1 species.	East India.
Ricinodendron.	1 species.	Tropical Africa.
Manniophyton.	2 species.	Tropical Africa.
Trigonostemon.	10 species.	Tropical Asia.
Paracroton.	1 species.	Malayan region.
Ostodes.	6 species.	Tropical Asia.
Codiæum.	4 species.	Malayan region, Australia and South-Pacific islands.
Blachia.	6 species.	East India and Eastern Asia.
Dimorphocalyx.	4 species.	Tropical Asia.
Cluytia.	28 species.	Southern extratropical and tropical Africa.
Agrostistachys.	6 species.	Tropical Africa and Asia.
Sumbavia.	1 species.	Malayan region.
Crotonogyne.	1 species.	Tropical Africa.
Chrozophora.	6 species.	Europe, East Mediterranean, and adjoining tropical regions.
Speranskia.	1 species.	North China.

Cephalocroton.	2 species.	Tropical Africa.
Adenochlæna.	3 species.	East India.
Erythrococca.	1 species.	Tropical Africa.
Hasskarlia.	1 species.	Tropical Africa.
Claoxylon.	42 species.	Africano-Australian region.
Micrococca.	1 species.	Tropical Africa and Asia.
Mercurialis.	6 species.	Europe, Mediterranean region, extra-tropical Asia.
Leidesia.	2 species.	Southern extratropical Africa.
Adenocline.	4 species.	Southern extratropical Africa.
Seidelia.	1 species.	Southern extratropical Africa.
Chloradenia.	2 species.	Malayan region.
Cœlodepas.	3 species.	Tropical Asia.
Lepidoturus.	3 species.	Tropical Africa and Madagascar.
Neoboutonia.	3 species.	Tropical Africa.
Cœlodiscus.	4 species.	Tropical Asia.
Podadenia.	1 species.	Ceylon.
Trewia.	2 species.	East India.
Coccoceras.	3 species.	Malayan region.
Mallotus.	70 species.	Africano-Australian region.
Macaranga.	80 species.	Africano-Australian region.
Homonoia.	4 species.	Tropical Asia.
Cheilosa.	1 species.	Malayan region.
Endospermum.	3 species.	Malayan region.
Cephalomappa.	1 species.	Malayan region.
Cladogynos.	1 species.	Malayan region.
Gelonium.	12 species.	Tropical Africa and Asia.
Baliospermum.	4 species.	East India.
Phyllobotrya.	1 species.	Tropical Africa.
Erismanthus	1 species.	Malayan region.
Epiprinus.	1 species.	Malayan region.
Pycnocoma.	8 species.	Tropical Africa and Madagascar.

A considerable number of these genera, especially the larger and widely spread ones, are much less systematically isolated, less strictly limited than the American ones. *Antidesma*, *Ostodes*, *Claoxylon*, *Mallotus*, and perhaps some others are centres round which several others might be grouped, as we have previously shown in *Phyllanthus* and *Excœcaria*; and even several of the smaller apparently isolated ones are more frequently intermediates between or distantly connected with others than in America, although no doubt there are several in Asia as well as in Africa to which no affinity nearer than the general tribual connexion can be traced.

Analyzing the above list, we have, in the first place, three northern

genera, *Chrozophora* and *Mercurialis* 6 species each, and *Speranskia* 1 species. The two former, essentially European, appear to have their chief seat in the eastern Mediterranean region, extending more or less southwards into the tropics; *Mercurialis* is there connected through the tropical African *Micrococca* with the great *Claoxylon* group. *Chrozophora* and the isolated North-Chinese *Speranskia* appear to me to be as distinct in character as in geographical distribution from each other as from the American *Argithamnia*, with which it has been proposed to unite them. Their old association with *Croton* may not have been so very far wrong as is supposed, notwithstanding the difference in the stamens which now removes them to a different subtribe.

Five genera are extratropical in South Africa, and four of them, comprising 9 species, exclusively so. Three, *Leidesia. Adenocline*, and *Seidelia*, are, like *Mercurialis*, but in a different direction, connected, through *Micrococca*, with the great *Claoxylon* group. *Toxicodendron* is quite isolated and monotypic; the fifth genus, *Cluytia*, with 28 species, is systematically isolated, and geographically only spreads into tropical Africa; but it has no near connexions there, still less in any other country.

Thirteen genera, comprising 32 species, are limited to tropical Africa or only extend to Madagascar. Seven of them are monotypic.

Two genera, both monotypic, are limited to Ceylon.

Fifteen genera, comprising 34 species, are as yet only known from the Malayan archipelago or Malacca, or scarcely extend to the South-Pacific islands. Nine of these are monotypic.

Twenty-one genera, with about 140 species, are more or less generally spread over tropical Asia including the Malayan archipelago, a few of them extending to Australia, but none westward into Africa. Only one of them is monotypic.

Twelve genera, with above 320 species, are more or less generally spread over the whole tropical Africano-Australian region. None of them are monotypic.

The Australian endemic genera of Euphorbiaceæ (exclusive of Euphorbieæ and Stenolobeæ) are five:—*Neorœpera*, 2 species, allied to *Phyllanthus*; *Petalostigma*, 1 species, allied to the Indian *Putranjiva*; *Cœlebogyne*, 1 species, allied to *Alchornea*; *Dissiliaria*, 3 species, allied to the Malayan *Choriophyllum*; and *Adriania*, 5 species, perhaps distantly connected with *Croton*.

There are nine New-Caledonian endemic genera, comprising 26

species, into the connexions and geography of which it would be premature to enter until the rich collections, now in the Paris Herbarium, shall have been fully worked up. Some appear to be quite isolated, others more or less connected with the Malayan flora.

I pass over also for the present six Madagascar genera comprising 7 species, which I have not had the opportunity of seeing. Many Madagascar plants have been described from single specimens, sometimes imperfect, in the herbaria of the Paris Museum or of Dupetit Thouars; and the Kew Herbarium is comparatively deficient in the flora of this island, one of the most interesting in respect of botanical geography. For that reason it is impossible now to enter satisfactorily into the questions connected with the close affinity of various genera or species endemic in Madagascar and in the Mexcano-Cuban regions respectively.

In conclusion, omitting the Eucrotoneæ, the Hippomaneæ, and the genera clustered round *Phyllanthus*, it will be observed that we have in America 14 monotypic genera, of which only one or perhaps two show any affinity to other American genera; whilst in the Old World, among the 35 montoypic genera at least 20 may be approximated to one, two, or more Old-World genera.

Among the smaller, but not monotypic, American genera there are only three, or perhaps four, cases where two or three can be brought together as being rather more nearly allied to each other than to any others. In the Old World at least a dozen such groups of two to six allied small genera might be formed.

Taking the largest genera in each continent, in America *Manihot* and *Argithamnia* are quite isolated. In the Old-World *Mallotus* and *Macaranga* pass into each other; and these, as well as *Antidesma* and *Claoxylon*, are each surrounded by a number of small allies often connecting them with other more distant ones.

All these considerations, as well as those I have brought forward in treating of genera common to the two continents, appear to me to favour the hypothesis above announced, that the most ancient home of the order was in the Old World, whence it spread in very remote times to America. And if we imagine that chief ancient home to have been somewhere in the supposed tract extending from tropical Africa and Madagascar to Australia and the Pacific, there are indications that in the Old World there

have been two chief centres of preservation subsequent differentiation and extension—one in or about east tropical Africa, whence the order extended northward but sparingly into Europe and southward to the Cape, the other towards the eastern extremity, where it extended very sparingly northward into China and Japan and more abundantly southward into Australia.

I would observe, however, that in speaking of the most ancient home of Euphorbiaceæ I do not mean to go back to that ancient geological period when Central Europe enjoyed a tropical climate and the Arctic regions a temperate one. We have as yet no evidence whatever of Euphorbiaceæ having then existed. If, however, they did then exist, Buxeæ may possibly be the result of an early differentiation even in those times; they may have originated in what are now temperate regions, and from thence have spread southwards, forming in America the West-Indian *Buxi* and the Andine *Stylocerases*, and in the Old World the *Buxi* proper and *Sarcococca*, remaining represented in the north by *Pachysandra* and *Simmondsia*. This, however, is not at all opposed to what has been said of the tropical origin of other extratropical Euphorbiaceæ.

On the Existence of *Carpesium cernuum* ?, Willd., in Queensland, in a Letter addressed to the Society's Secretary. By LEWIS A. BERNAYS, Esq., F.L.S., Vice-Pres. Queensland Acclimatization Society.

[Read November 7, 1878.]

I HAVE just returned from a few days' trip among the mountain-ranges forming the watershed of the Brisbane Waterworks, which I spent in examining, accompanied by Mr. F. M. Bailey, Keeper of the Queensland Herbarium, an able and experienced botanist. In the course of our rambles we fell in with a species of *Carpesium*, probably the *C. cernuum*, Willd., of which I send you herewith a specimen under special cover.

Some years ago Mr. Bailey met with a plant of this genus; but Baron Mueller (to whom he sent it) expressed the belief that it must have been imported. The discovery this time sets the supposition quite at rest, as the locality in which we found the speci-

men which I send to the Society is one which has never been trodden except by an occasional wandering digger, and is quite inaccessible for wheel-traffic.

The existence of *Carpesium* in Queensland must now, I think, be accepted as a fact; but I shall be favoured by your submitting my letter to the Council of your Society, and beg that you will will be good enough to convey to me any conclusions at which they may arrive.

Brisbane, April 15th, 1878.

The specimen in question, after having been laid before the Council, was compared with those in the Kew Herbarium, and shown to Mr. Bentham, Prof. Oliver, and Mr. J. G. Baker. They all agree as to its correct identification; and the latter botanist adds in a note:—"The plant is the true *Carpesium cernuum*; it is known in the Malay isles, but not in Polynesia." In the discussion following the reading of Mr. Bernays's letter at the Society's Meeting the general impression remained that though doubtless the plant is *C. cernuum*, the evidence of its being indigenous to Australia is still somewhat equivocal, especially seeing that the said plant is, so to say, a common weed in India, and therefore, in a variety of ways, might have got accidentally introduced into the Australian area.—Editor.

Notes on Cleistogamic Flowers; chiefly of *Viola, Oxalis*, and *Impatiens*. By ALFRED W. BENNETT, M.A., B.Sc., F.L.S., Lecturer on Botany at St. Thomas's Hospital.

[Read November 7, 1878.]

THE most important records of observations hitherto made on the closed self-fertilized flowers which some plants possess are those by D. Müller in the 'Botanische Zeitung' for 1857, by Michalet in the 'Bulletin de la Société Botanique de France' for 1860, by Von Mohl in the 'Botanische Zeitung' for 1863, and by M. Kuhn in the same journal for 1867. These and some other scattered notes are admirably summarized, and supplemented with some observations of his own, by Mr. Darwin, in the last chapter of his 'Different Forms of Flowers on Plants of the same Species' (1877). I am not aware, however, that, with the exception of my paper on the closed self-fertilized flowers of *Impatiens fulva*, the English reader has access to any original drawings of this interesting class of flowers. This, and the important bearing on the laws of the fertilization of flowers of any addition, however slight, to our knowledge of the structure and function of these flowers, must be my excuse for bringing the following imperfect notes before the Fellows of the Linnean Society. My observations on *Viola sylvatica, Oxalis Acetosella*, and *Impatiens noli-me-tangere* were made on wild specimens gathered in August and September in a mountainous part of Wales; those on the other species of *Viola* and *Impatiens* on specimens from the Botanic Gardens at Kew and in the Regent's Park, during September and the early part of October of the present year (1878).

VIOLA.

V. cucullata, Ait. (North America).—This common North-American violet produces through the autumn abundance of cleistogamic flowers on long erect pedicels springing from near the crown of the root. They are fully one third of an inch in length, the largest I am acquainted with in any species of violet, and exceedingly favourable for observation. I have had but little opportunity of observing their fertility, and comparing it with that of the perfect vernal flowers. The calyx consists of five nearly equal, linear-lanceolate, slightly auricled sepals, which are imbricate, and never open, even at the tip, until the growth of the fertilized capsule forces them apart. The corolla is, as far as I could

detect, entirely suppressed. The ovary is large and conical, and is surmounted by a style and stigma which at once attract attention. The form of these organs in the perfect flowers of this section of *Viola* (I have had no opportunity of observing them in this particular species) are, as is well known, as follows:—The elongated style rises on the summit of the ovary from a very narrow base, gradually thickening upwards, and bearing the stigma, in appearance remarkably like the beak of a bird, the actual stigmatic surface being a minute cavity (*b*) on the upper side of this beak near its extremity (fig. 1). In the cleistogamic

Fig. 1.

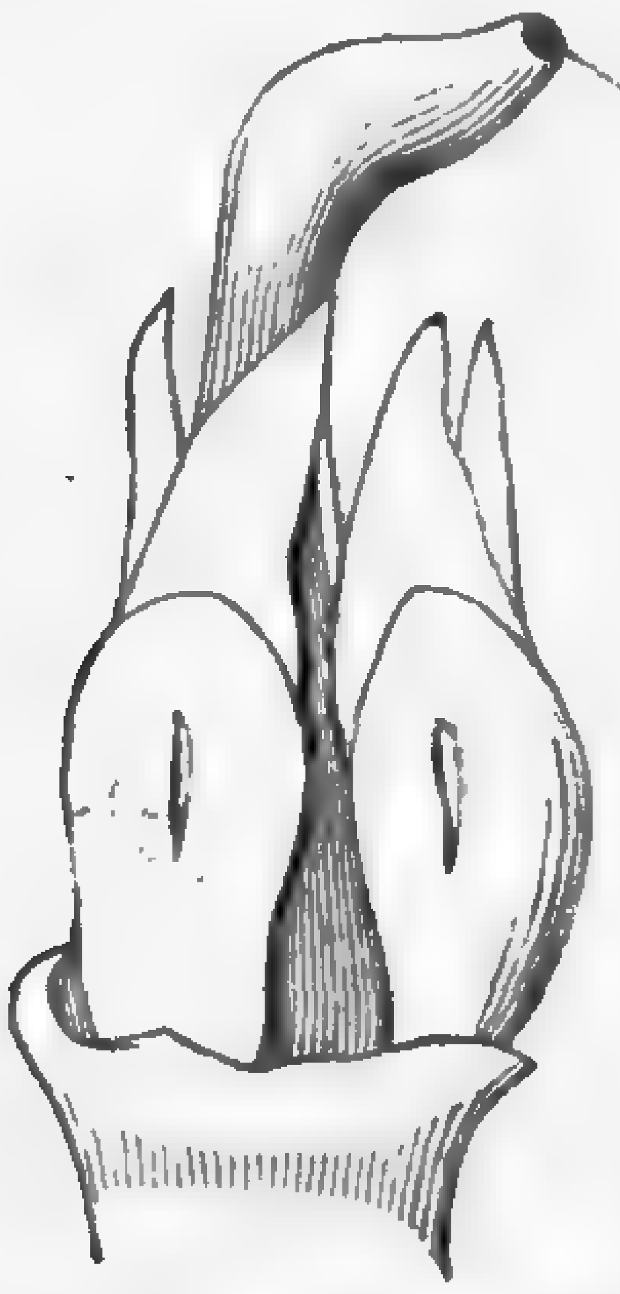


Fig. 2.

Viola odorata. 1. Stamens and pistil of perfect flower; *b*, stigmatic cavity. 2. Perfect stamen.

flowers the style is very short, and curved over in a semicircle, the flat stigmatic surface, which faces downwards, being perforated by a funnel-shaped cavity, as shown in figs. 3, 4, and 5. The stamens present as great a divergence. Instead of the five sessile anthers, each consisting of two closely approximate anther-lobes

Fig. 3.

Fig. 4.

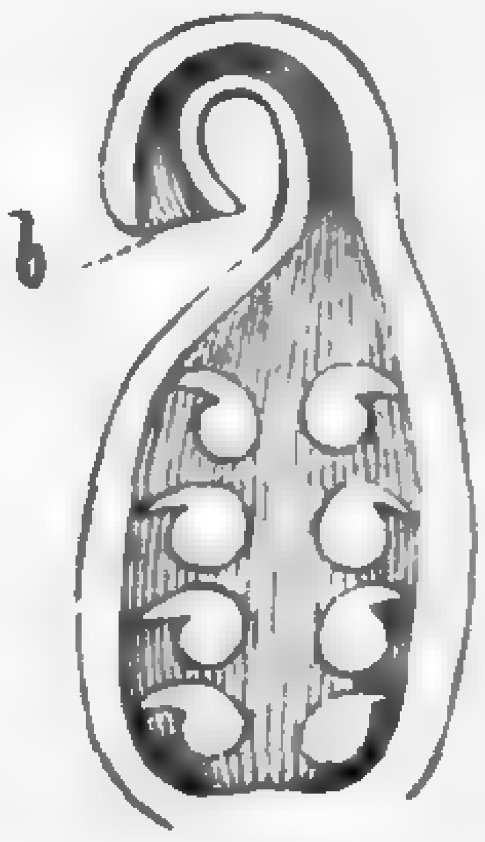
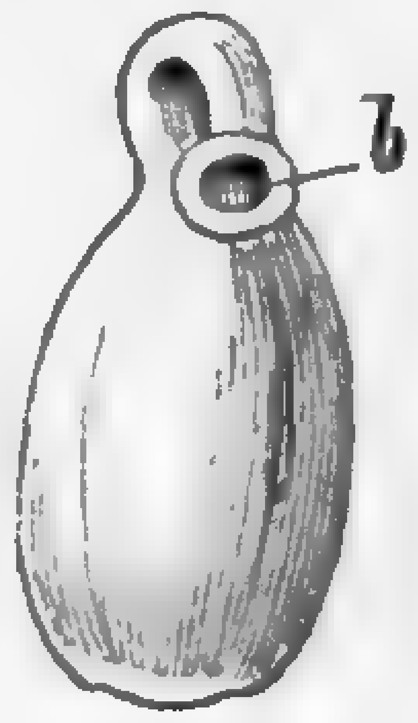


Fig. 5.



Viola cucullata. 3. Pistil of cleistogamic flower. 4. Section of same, showing perforation through the style*. 5. Front view of the stigmatic cavity.

opening by longitudinal slits, and surmounted by a membranous

* In order to make the drawing clearer, the channel through the style is made considerably wider than it is in nature.

orange-yellow extension of the connective (fig. 2), the number is reduced to two, or the merest rudiments are discernible of the other three; these two (fig. 6) have long, brown, strap-shaped filaments, ending in a large brown spoon-shaped prolongation of the connective, at the base of which are placed the two anther-lobes at some distance from one another and opening by terminal pores. These anther-lobes attach themselves with such strength to the recurved stigma that they adhere to it with the growth of the ovary, the filaments being ruptured at their base (figs. 7, 8). Here they may frequently be seen even when the capsule is nearly mature. Finally, the pollen-grains are very few in number, of very small size, and their cell-wall evidently very thin and transparent. The structure is, it will be seen, in all important points identical with that described by

Fig. 6.

V. cucullata. Fertile stamen.

Fig. 7.

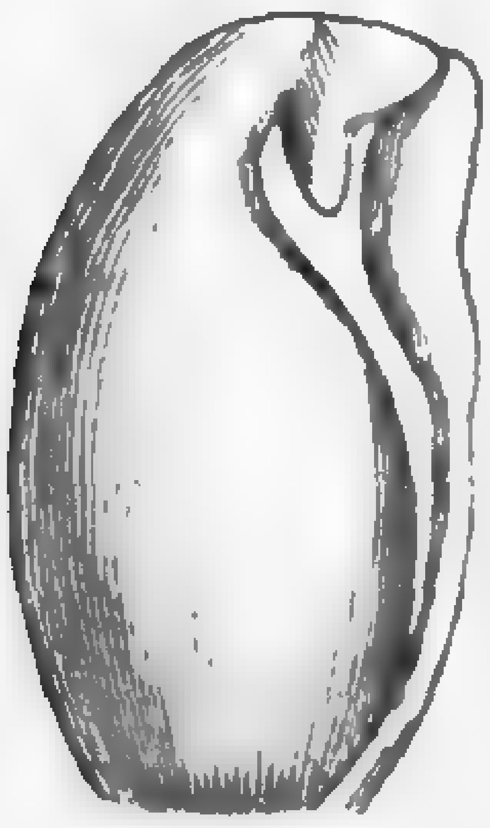
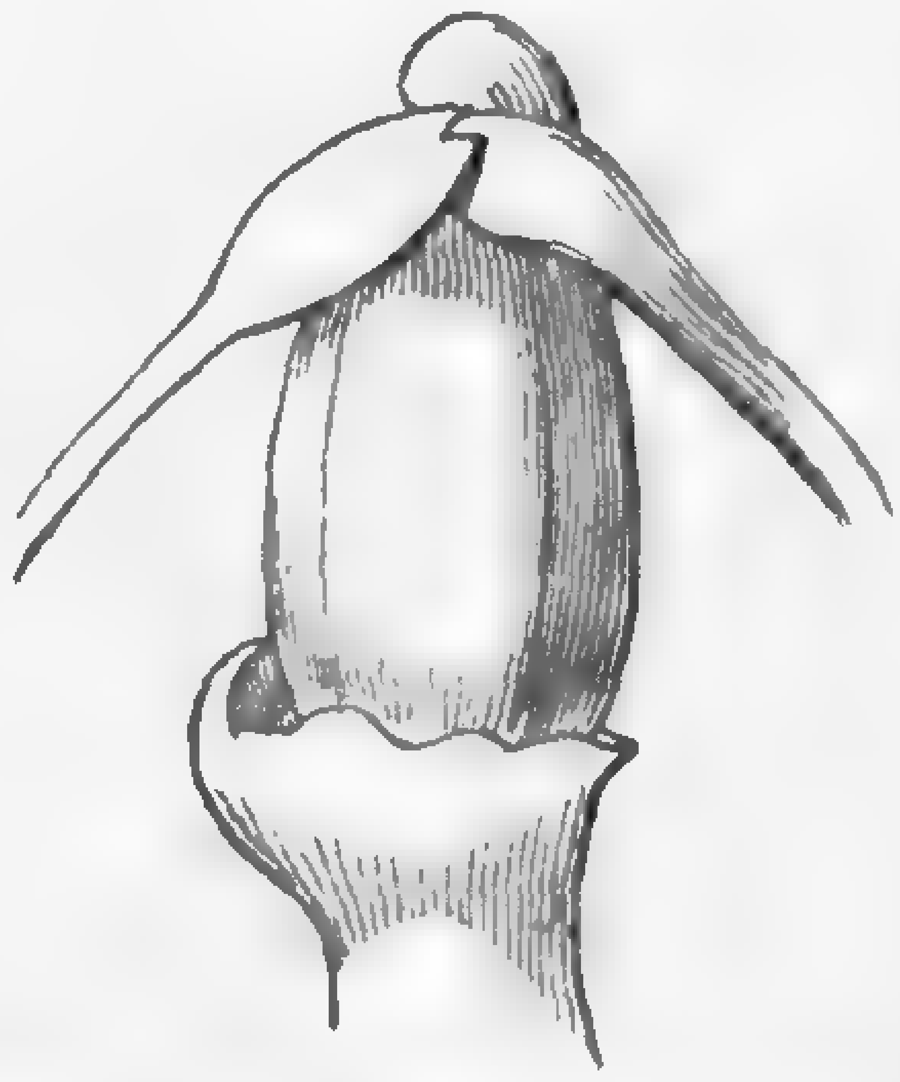


Fig. 8.



Viola cucullata. 7. Side view of pistil, with stamen attached to stigma. 8. Front view of pistil, with two stamens attached to stigma.

Darwin in the case of *V. canina*; and there is also one other point of resemblance. Darwin describes, in the case of the species just named, and Michalet in that of *V. alba*, an open passage conducting from the funnel-shaped stigmatic cavity to the upper part of the ovary. This was most clearly evident in *V. cucullata* (as shown in fig. 4), as well as in other species subsequently examined. What, however, the purpose of this passage may be is more difficult to determine. Is it for the passage of the pollen-tubes? Darwin states that he "was able to trace the tubes from the grains some way down the stigma," but does not say that they made their way down this passage. In none of the various descriptions of cleistogamic flowers have I been able to find that the actual

entry of the tubes into the ovules has been observed; nor, in the very large number of specimens examined by me, have I been completely successful on this point. It appears to me that, as D. Müller and Von Mohl observe, the process must take place with great rapidity, and be consequently very difficult of detection. It is, however, very easy to get good sections of the opening of this passage into the ovary, and I have never been able to detect the least trace of pollen-tubes entering the ovary by this means. Moreover, where they can be seen passing from the anther into the stigma, they enter, as it seems to me, not the funnel-shaped cavity but its anterior wall (figs. 4, 5, *b*). The structure of the ovules in *Viola* seems also to negative the probability of the pollen-tubes entering the ovary in this way. These exhibit in this genus, as is well known, an extreme instance of the anatropous structure, which is as marked in the cleistogamic as in the perfect flowers, the large micropyle being brought into very near contact with the wall of the ovary. This structure would appear to be a decided disadvantage if the pollen-tubes reached the ovary through the open passage at its apex; and I am inclined to think that their mode of access must be the same as that observed by Dr. P. M. Duncan in the case of *Primula*, through the tissue of the wall of the ovary itself, whence they diverge in close proximity to the placenta, and consequently to the micropyle of the ovule. I express this opinion, however, with considerable diffidence; and more exact observations on this point are wanted, as well as on the purpose of the passage through the style, which Mr. Darwin states does not exist in the perfect flowers of *V. canina*.

Fig. 9.

Viola sylvatica.
General view of cleistogamic flower.

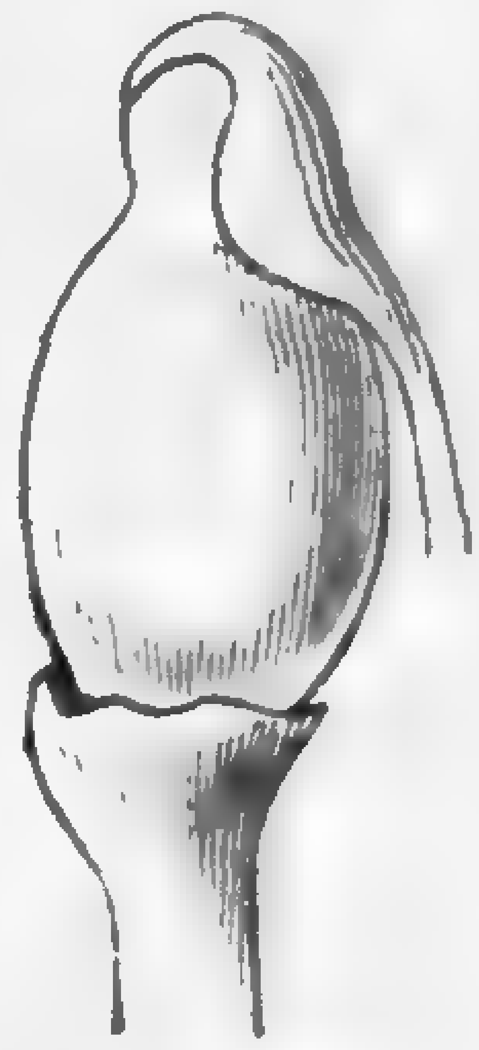
V. sylvatica, Fries.—The cleistogamic flowers appear in great numbers throughout the autumn. They are about one eighth of an inch in length. The calyx (fig. 9) consists of five sepals, which are only slightly imbricate and unequal in size; two adjacent (inferior) sepals are prolonged at the base into an auricle, and also somewhat overlap the rest at the apex; the two lateral ones are the smallest, and the superior sepal is of intermediate size. The corolla is, as far as I could detect, completely abortive. The ovary is nearly spherical; the style is very short and curved, so as to form a semicircle, the stigmatic surface facing downwards, as

in *V. cucullata*. The fertile stamens (fig. 10) resemble in important points of structure those of the last-named species, but the terminal prolongation of the connective is much broader and larger, in shape like a hood, and toothed at the side; the two anther-lobes are often a considerable distance apart, and are ciliated at the margin. The number of fertile stamens varies. Most usually there are only two, which are coherent by their edges, the two hood-like connectives overlapping one another and forming a cap which is closely applied to the stigmatic surface, completely covering it up (fig. 11), and only detached from it with difficulty, the filaments being ruptured at the base by the growth of the ovary, as in the last species. Occasionally there are four fertile stamens, which are then coherent in pairs, each pair forming a cap. In one instance I found five; but the fifth, which stood by itself at the back of the ovary, had only a single anther-lobe. The remaining stamens are almost always present in a rudimentary condition, and consist of an obovate or subulate brown filament, nearly as long as the fertile stamens, denticulate at the margin, and without a trace of anther-lobes (fig. 12). The anther-lobes open by apical pores, which are in immediate contact with the anterior lip of the stigmatic cavity; and the pollen-tubes may be distinctly seen ascending vertically through the pores. The pollen-grains are extremely few in each anther-lobe, minute, ellipsoidal, and with transparent cell-wall. In order to test the fertility of these cleistogamic flowers, I counted the ovules in a number of unfertilized ovaries, and the seeds in a number of mature capsules which were evidently the product of closed flowers. In six unfertilized ovaries I found an average of 13 ovules, the number varying from 10 to 18. In twenty mature capsules the number of seeds varied between 4 and 20, the average being 12·5. It is evident, therefore, that, as far as these numbers offer any indication, but few of the ovules remain unimpregnated. It should, however, be noted that in almost every plant of *V. sylvatica* which I examined (and these were a very large number) I ob-

Fig. 10.

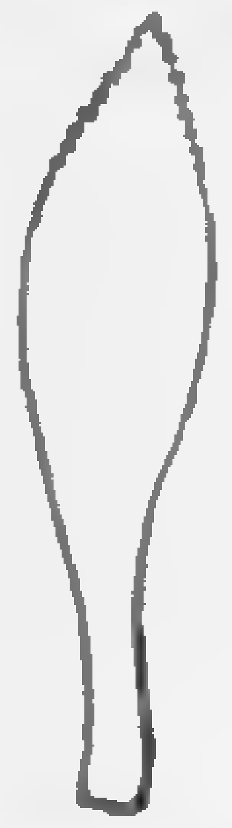
V. sylvatica. Fertile stamen.

Fig. 11.



V. sylvatica. Side view of pistil, with stamen attached to stigma.

Fig. 12.



V. sylvatica. Barren stamen.

served withered abortive capsules, evidently the result of cleistogamic flowers, which contained nothing but unimpregnated ovules.

On specimens of *V. sylvatica* observed in the Regent's Park Botanic Gardens near the end of September, I found two flowers which presented interesting stages of transition between the perfect and the cleistogamic forms. In the first, the corolla consisted of five spathulate petals, blue, and slightly exserted beyond the calyx, one of them being much larger than the rest and swollen at the base, but not prolonged into a spur. There were four antheriferous stamens, nearly the shape of those in the ordinary cleistogamic flowers, but with rather shorter filaments, two of them uniting into the usual hood-like cap to the stigma. The pollen-grains were very numerous, the shape and size of those of the perfect flowers, and were putting out abundance of pollen-tubes into the tissue of the stigma, one grain being observed with as many as three tubes. The style and stigma were nearly the shape of those of the ordinary closed flowers, but the stigmatic surface not so flat. In the second flower the corolla consisted of five nearly white, very imperfectly developed petals. The stamens and pistil were those of the perfect flowers—the former, five in number, having all sessile anthers surmounted by a bright orange-yellow prolongation of the connective, while the ovary terminated in a long narrow style and beak-like stigma, bent nearly at right angles. No indication was observed of impregnation of the ovules. In the first of these intermediate flowers, therefore, the organs of reproduction partook almost entirely of the character of those of the usual cleistogamic flowers, with the exception of the form and size of the pollen-grains, which were entirely, and the corolla partially, of the nature of those found in the perfect flowers. The second was an ordinary perfect flower, with the exception of the rudimentary corolla.

V. floribunda, Jord. (France).—The cleistogamic flowers are borne in the axils of the leaves on the low creeping stems which develop in the summer and autumn. The calyx, consisting of five nearly equal lanceolate sepals without auricles, is borne on an elongated hairy pedicel. The corolla consists of five brown, equal, membranous scales, nearly as large as the sepals, which form a cap completely covering up the reproductive organs. There are five stamens, all fertile, with a brown hood-like membrane to the connective rising above the anther-lobes, resembling that of *V. cu-*

cullata, one pair of anthers being closely adpressed to the stigma. The ovary is slightly hairy, the style very short and curved in a semicircle, so that the stigmatic surface faces downwards. This was the structure in two flowers that I examined. In two other perfectly closed flowers, borne in similar situations (in the early part of October), the structure was very nearly the same as in the normal perfect flowers, except that the petals were small, transparent, and colourless. The stamens had sessile anthers surmounted by a transparent colourless prolongation of the connective, the style was erect and elongated, and the stigma bent at right angles. There was no indication that fertilization had been accomplished in these flowers. I observed no flowers in any intermediate stage between these two kinds of closed flowers. I could not detect any tendency of the ripe capsules to bury themselves in the earth, as is stated, by D. Müller, Vaucher, and Lecoq, to be the case with those of *V. odorata.*

V. sagittata, Ait. (North America).—The cleistogamic flowers present considerable resemblance in appearance and in position to those of *V. cucullata*, but are somewhat smaller. In the flowers examined by me there were only two fertile and one abortive stamen; the two fertile ones have long filaments and large hood-like prolongations of the connective, which adhere firmly to the stigma even when the capsule has attained a considerable size; the very short style and stigma are depressed in the hollow of the obovate ovary. The anther-lobes are approximate, and evidently dehisce by terminal pores. The corolla is altogether wanting. Both in this species and the next the capsules contain a considerable number of unfertilized ovules.

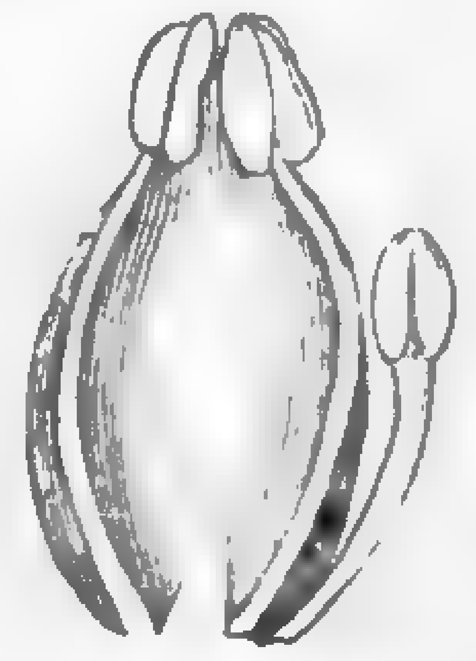
V. elatior, Fries (Central Europe).—The cleistogamic flowers are borne in the axils of the leaves on the erect stem. In the single one which I have had the opportunity of dissecting, the five sepals are of a purple colour. There are only two fertile stamens, which are attached to the bases of the two anterior sepals, and resemble in all important points those of *V. cucullata.* I observed no barren stamens. The short semicircular style and flat stigma altogether resemble those in the species already described.

Oxalis.

O. Acetosella, Linn.—The cleistogamic flowers are produced abundantly in the summer and autumn, in the same position as

the vernal perfect flowers. The pedicels are shorter, and the buds and the young fruit are pendent; but the ripe capsule is erect; and in this flower, as in the sweet violet, I was unable to detect the tendency, described by Michalet and Von Mohl, of the capsules to bury themselves in the earth. The closed flowers are about one sixth of an inch in length, and do not present by any means the same diversity of structure from the normal perfect flowers as is exhibited in the case of *Viola*. The five sepals are lanceolate, green, mottled with brown, and never expand. The corolla, which I never found to be entirely suppressed, presents great diversity in its degree of development; the petals are sometimes entirely included, and remain green, while sometimes they assume a white colour, their tips being exserted beyond the calyx, in that case all the five petals are pushed off in the form of a cap by the growth of the ovary. The ten stamens all produce pollen; the five inner and longer ones have their anthers on a level with and resting on the five stigmas (fig. 13); while the anthers of the five outer stamens do not reach more than halfway up the ovary, and appeared to me to be functionless. Darwin, however, has seen pollen-tubes from these reach the stigma; while Michalet, on the other hand, describes them as sterile, or even frequently abortive. The capsules contain numerous seeds, and are provided, like those of the perfect flowers, with elastic valves; but I had no opportunity of comparing the fertility of the closed and perfect flowers.

Fig. 13.



Oxalis Acetosella. Pistil and stamens of cleistogamic flowers.

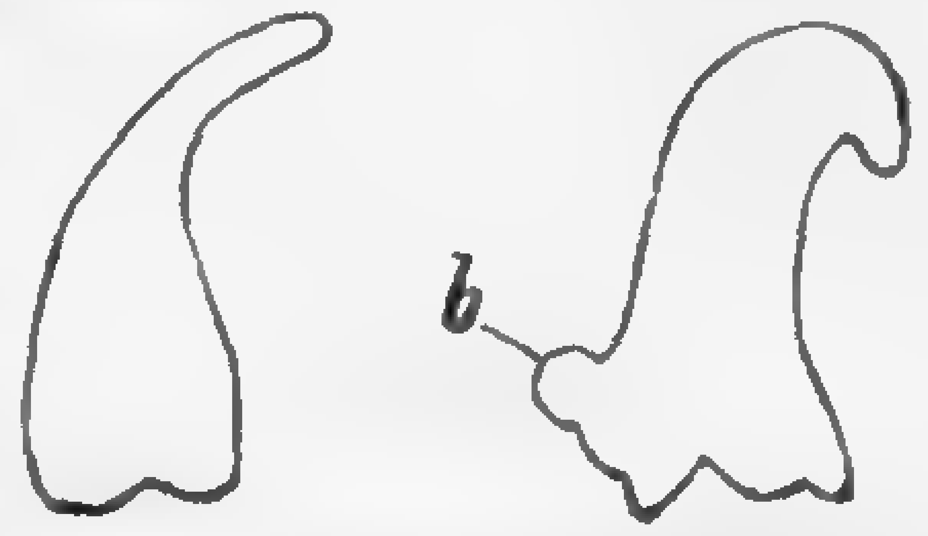
Impatiens.

I. noli-me-tangere, Linn.—The small cleistogamic flowers are produced in abundance, unquestionably at the same time as the handsome open flowers, and on the same plant and same branch, thus presenting a contrast to what I formerly observed in the case of *I. fulva**. The calyx presents a strong resemblance to that of the closed flowers of the last-named species, constituting a small brown cap which becomes detached at the base by the growth of the capsule, and which completely covers up the organs of reproduction. The five stamens are similar to those of the closed flowers of *I. fulva*; the filament is strap-shaped, nearly straight, transparent, and terminates in an arrow-shaped anther;

* See 'Journal of Linnean Society, Botany,' 1872, vol. xiii. p. 147.

the pollen-grains are very few in number, of small size, and are not connected together by threads, as is the case with those of the perfect flowers. In the perfect flowers the anthers contain bundles of raphides about the length of the pollen-grains; but these I never observed in the case of the closed flowers. A slight but very interesting variation from the usual structure of the closed flowers was observed in three instances. In all the remainder of the very large number which I examined the brown calyx broke away smooth from the receptacle as a regular conical cap (as shown in fig. 14), not manifesting the least trace of a division into distinct sepals. In these three instances, however, the cap exhibited a protuberance at one side (fig. 15, *b*), clearly a rudimentary survival of the large spur-shaped nectary which is so conspicuous in the perfect flowers.

Fig. 14. Fig. 15.



Impatiens noli-me-tangere.
14. Cap-like calyx of cleistogamic flower, ordinary form. 15. The same, with rudiment of nectary *b*.

I. parviflora, DC. (Northern Europe).—I have never been able to detect any cleistogamic flowers in this species, which comes up in great abundance and flowers very freely every year in the Regent's Park Botanic Gardens, as well as in my own garden. The plant seems invariably to produce abundance of capsules which are undoubtedly the products of the perfect flowers, as may be seen by the withered stamens which frequently adhere to the apex. In no case have I found a capsule surmounted by a brown cap, as in the case of *I. fulva* and *I. noli-me-tangere.* Independently of the much smaller size, the flower presents considerable differences from those of these two species; and there is by no means the same difficulty in understanding how fertilization can take place as there is in the case of *I. fulva* (see 'Journ. Linn. Soc., Bot.' vol. xiii. p. 150). The whole flower does not drop in one piece, as is the case in this latter species; but first the sepals and petals separately, and then the stamens, the filaments breaking away at their base, while the five coherent anthers frequently remain attached to the stigmas for a considerable time. The pollen is loose and powdery, and not attached together by threads. The five stigmas are frequently expanded, and apparently in a receptive condition, after the stamens and the rest of the flower have been thrown off, a state of things which I have never seen in either of the two other species. Mr. Henslow says that they are self-fertilized.

I. glandulifera, Arn. (Ceylon), does not appear to bear cleistogamic flowers. I observe that, in his 'Flora of British India,' Sir J. D. Hooker states that the capsule is unknown.

General Remarks.

It will be observed that cleistogamic flowers are of two kinds: first, those which hardly differ from the perfect open flowers in any other respect than the partial or entire suppression of the corolla and the closing of the calyx; secondly, those in which there is a distinct modification of one or more parts of the flower to aid in the process of self-fertilization. The first kind, which may perhaps be called "homocleistogamic," are well illustrated in the case of *Oxalis Acetosella* and in that of *Drosera rotundifolia*, as described by Mr. Darwin; the second kind, or "heterocleistogamic," by the dimorphic species of *Viola* and *Impatiens*. There is not of course any exact line of demarcation between the two kinds, and intermediate forms occur, as in *Viola sylvatica*; while the homocleistogamic pass insensibly into the normal open flowers. I was at first disposed to think that these two kinds of closed flowers might have arisen in different ways, the one by degradation, the other as a rudimentary form of the organ. But that the heterocleistogamic flowers are really degraded normal flowers is, I think, sufficiently shown by the frequent occurrence in them of points of structure which are absolutely useless to them when self-fertilized, and which can only be regarded as survivals from the normal flowers—as, for instance, the abortive stamens in *Viola*; the occurrence of the short outer whorl of stamens in *Oxalis*; and, as Mr. Darwin points out, the fact that in the cleistogamic flowers of *Ononis columnæ* the ten filaments are united together into a tube. Again, in the extremely heterocleistogamic flowers of *Impatiens noli-me-tangere*, I do not know on what other theory to account for the fact, insignificant as it may seem in itself, to which I have already alluded, that the brown cap-like calyx has occasionally a protuberance on one side, which is evidently a rudimentary nectary. If, however, this hypothesis is correct, it is very remarkable how comparatively rarely we find intermediate forms between the perfect and the closed flowers in these species.

The next point which attracts our attention is the large number of organs which have been correlatively modified in the extreme heterocleistogamic flowers. Take, for instance, any of the

species described above of the genus *Viola*. We have (1) diminution in size of the calyx, and especially of the auricles at the base of the sepals; (2) entire or complete abortion of the corolla and consequently of the nectary; (3) diminution in the number of perfect stamens; (4) elevation of the anthers on an elongated filament, together with the entire suppression of the nectariferous appendages to the two inferior stamens; (5) great increase in the relative size of the prolongation of the connective and loss of its brilliant orange colour; this is accompanied by a diminution in size and a separation of the anther-lobes; (6) alteration in the mode of dehiscence of the anthers; (7) diminution in number of the pollen-grains; (8) diminution in size and complete alteration in texture of the pollen-grains; (9) great decrease in length, and complete alteration in shape, of the style; (10) complete alteration in form and position of the stigmatic cavity; (11) formation of a "tube-connecteur" through the style. With regard, however, to this last point, the statement that no such tube exists in the elongated style of the normal flowers of *V. canina* (*sylvatica*) is made on the authority of Mr. Darwin ('Forms of Flowers,' p. 315); but I am inclined to doubt its correctness. At all events, in the few perfect flowers of *V. odorata* which I have had the opportunity of examining in reference to this point, there clearly is such an open passage (see fig. 1, *b*). Moreover, in our ordinary text-books the style of *V. tricolor* is described as being perforated by a similar channel (see, *e. g.*, Sachs's 'Text-book of Botany,' 3rd ed., English translation, fig. 364, p. 499). Even, however, if this be omitted, the number of correlated modifications is sufficiently remarkable. If we look at the number of species of violet in which these flowers occur, and the remarkable similarity of the ten or eleven modifications in them all, we are forced to the conclusion that they must have originated before the differentiation of these species, which are spread widely over the globe. On the other hand, all the species of *Viola* in which cleistogamic flowers occur belong to the section *Nominium*; while in the section *Melanium*, to which *V. tricolor* belongs, none have yet been detected; and we may therefore suppose that the first production of these flowers was subsequent to the differentiation of the genus into subgenera.

The observation of the actual impregnation in these flowers is, as I have already observed, attended with the greatest difficulties. But the mode of the emission of the pollen-tubes presents the most striking and interesting phenomena. Any one who has made

a study of pollen must be familiar with the fact that the emission of tubes by pollen-grains while still within the anther is by no means an uncommon occurrence. Robert Brown and Baillon have indeed observed them to attain a considerable length. But this offers scarcely any explanation of the extraordinary fact that in these closed flowers the pollen-tubes will reach the stigmatic surface or cavity after travelling for a considerable distance through the air in a straight line from the anthers, vertically upwards in the case of *Oxalis*, horizontally in others; while in *Viola canina*, according to Von Mohl's description, they creep for a distance along the surface and over the back of the ovary. None are seen wandering aimlessly about in uncertainty; they all seem guided by some unseen agency in the required direction; and yet an experiment of Darwin's ('Forms of Flowers,' p. 337) sufficiently shows that when not in proximity to the stigma, pollen-grains protrude their tubes in all possible directions. I may add that I have never seen myself, nor do I find it stated in any trustworthy description, that the pollen-tubes ever actually perforate the wall of the anther in order to reach the stigma in cleistogamic flowers, as is stated to be the case in *Juncus bufonius* *; they always make their way either through terminal pores, or, as Von Mohl describes it, through the sutures of the anther. It seems hardly possible to attribute to heredity only such an apparently spontaneous tendency. If pollen-grains are able through many generations to acquire such a power as this, all need for an exciting stigmatic surface, and even for the carriage of pollen to the stigma, would seem to be obviated. The subject certainly deserves much closer and fuller investigation than it has yet received.

Note.—Since the above paper was written, two papers have been published containing drawings of cleistogamic flowers, both by the Rev. G. Henslow. In the 'Transactions of the Linnean Society,' Botany, 2nd series, vol. i. p. 317, are drawings of the closed self-fertilized flowers of *Viola odorata* and *V. canina*, *Oxalis Acetosella*, *Lamium amplexicaule*, *Epiphegus virginiana*, and *Hordeum murinum*; and in the 'Popular Science Review' for Jan. 1879, of most of the same species, as well as many others. Both are accompanied by excellent descriptions.

* See Batalin in 'Botanische Zeitung,' 1871, vol. xxix. p. 388.

Notes on Algæ from Lake Nyassa, E. Africa.

By George Dickie, M.D., F.L.S.

[Read November 21, 1878.]

I am indebted to Dr. Laws, of the Livingstonia Mission, Lake Nyassa, for the materials which yielded the organisms recorded here. Nearly all were attached to aquatic Phænogams; and a list of these may not be out of place, for which I owe to Professor Oliver assistance in naming them; most were imperfect, and therefore the genus only is stated in most cases. They are as follows:—*Vallisneria spiralis*, *Ceratophyllum* sp., *Potamogeton* sp., *Myriophyllum* sp., *Urticularia* sp., *Lagarosiphon muscoides*?, *Trapa bispinosa*?, and one of the Marsiliaceæ, viz. *Azolla pinnata*.

The list of Algæ is doubtless very meagre, with exception of the Diatoms; still, as the locality is of some interest, I have thought the species worthy of record in the meantime. I have to acknowledge assistance from the Rev. G. Davidson in compiling the list of Diatoms.

Conferva ——? A few fragments only; the joints six times longer than broad, the diameter =·001; colour pale green.

Bulbochæte parvula, *Ktz.* There is no doubt about the genus; nearest to the species stated, if not identical.

Spirogyra pallida, n. sp.? Pallide flavo-virescens, minus lubrica, articulis cylindricis, diametro (=·00125) 4plo longioribus, fructiferis?; fasciis spiralibus 3, angustis, nodulosis; zygosporis? Cytioderma cellulæ, utroque fine nec protensum nec replicatum.

From an island in Livingstonia Bay, Lake Nyassa.

Cosmarium margaritiferum, *Turp.* The examples seemed quite identical with the European species.

Oscillaria ——? Trichomatibus strictis, distincte articulatis, articulis diametro (·00005) æqualibus; cytioplasmate pallide olivaceo.

Lyngbya martensiana, *Menegh.*? The plant was attached to *Potamogeton*, and seems identical with, or nearly allied to, the species described by Meneghini, and found in thermal waters near Verona, also at Baden-Baden, and reported by Mertens as found at St. Helena.

CYLINDROSPERMUM NYASSÆ, n. sp. Trichomatibus rectis, in stratum cæruleum intricatis, articulis ellipticis, diametro (·00005) duplo longioribus; sporis ?

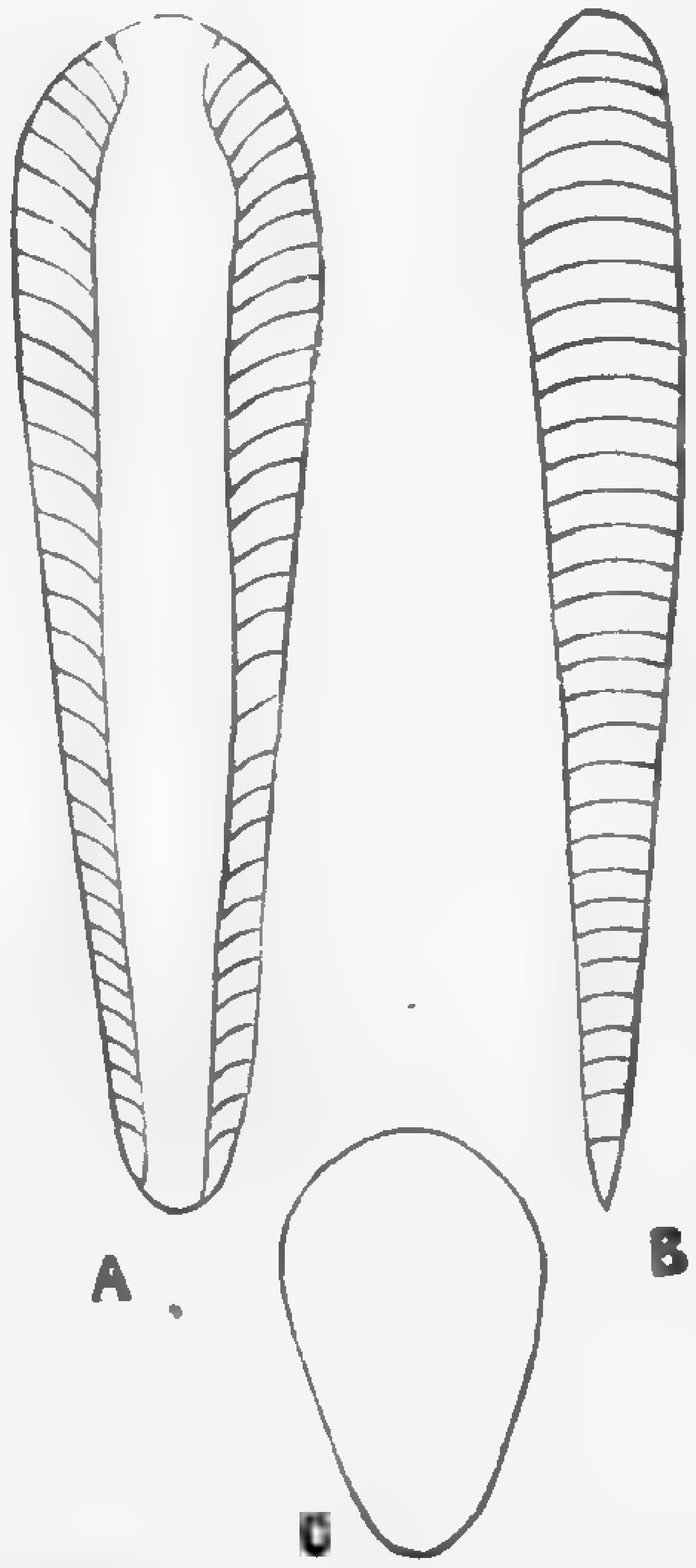
It communicates to water a blue solution with dull-red fluorescence.

DIATOMACEÆ.

Cyclotella rotula, *Ktz.*
C. operculata, *Ktz.*
Epithemia ventricosa, *Ktz.*
E. zebra, *Ehb.*
Epithemia alpestris, *Sm.*
E. sorex, *Ktz.*
E. turgida, *Ktz.*

EPITHEMIA CLAVATA, n. sp. Mediocris, plus minusve clavata, apicibus rotundato-obtusis, costis validis subparallelis, 15 in ·001; latere superiore (dorso) convexo, inferiore subrecto. Long. = ·001–·007 poll.

More or less plentiful on most of the Phænogams already noted, but especially so on the *Spirogyra*. The clavate form at once distinguishes it from any known species; at first sight it has a resemblance to *Surirella* (see woodcut). The striæ proper are not represented here; they are 30 in ·001.



Epithemia clavata: A. frontal, B. lateral view; C. small frustule in outline; all greatly magnified.

Eunotia tridentula, *Ehrb.*
Himantidium pectinale, *Ktz.*
Cocconema cymbiforme, *Ehb.*
C. cistula, *Hemp.*
Amphora ovalis, *Ktz.*
Encyonema prostratum, *Berk.*
Cocconeis placentula, *Ehb.*
Fragilaria undata, *Sm.*
Synedra ulna, *Ehb.*
S. acus, *Ktz.*
S. biceps, *Ktz.*
Navicula acrosphæria, *Rabh.*, var. sandvicensis, *Schmidt.*
Navicula gibberula, *Sm.*
N. gastrum, *Ehb.*
N. elliptica, *Ktz.*
N. rhomboides, *Ehb.*
N. gracillima, *Pritch.*
Stauroneis phœnicenteron, *Ehb.*
Diadesmis confervacea, *Ktz.*
Gomphonema dichotomum, *Ktz.*
G. intricatum, *Ktz.*
G. naviculoides, *Sm.*
G. turris, *Ehb.*

It will be observed that all the genera of Algæ enumerated here are well-known European &c. forms. Nearly all the species of Diatomaceæ are also very widely diffused elsewhere; the exceptions are few, *Diadesmis* for instance, hitherto confined to the West Indies. The only peculiar form is the new *Epithemia*.

On the Symplocaceæ. By JOHN MIERS, F.R.S., F.L.S., &c., Dignit. et Commend. Ord. Imp. Bras.

[Read November 21, 1878.]

IT is now 40 years ago, after a careful examination of the plants of the two families, that I became convinced that the groups of the *Styraceæ* and *Symplocaceæ* should be separated into two natural Orders; but it was not till 1851 that I gave publicity to this opinion[1], which I then supported under strong evidence. G. Don, it is true, first suggested this separation in 1837[2]; but the order which he then established consisted only of the genus *Symplocos*, which he divided into sections: (1) *Alstonia*, (2) *Lhodra*, (3) *Palura*—a very incomplete arrangement.

It is to Mr. Bentham that our best thanks are due for first elaborating the characters of true *Symplocos* in 1841[3], a contribution rendered more valuable by an excellent analytical drawing. Besides this, he did much in that estimable memoir to explain the structures of *Alstonia*, *Hopea*, *Ciponima*, and *Lhodra*, thus laying the foundation of our real knowledge of the family. Following in the footsteps thus well marked out in this early stage of the inquiry, I have elaborated the present memoir under a long promise to that effect.

As a preliminary, it was necessary to adduce undeniable evidence in support of the *Symplocaceæ* as a natural order distinct from the *Styraceæ*. In addition to the facts already quoted from my contributions, I may refer to the summary offered in Lindley's 'Veget. Kingdom'[4] and to another of my own showing[5].

[1] Contrib. Bot. i. p. 22; Ann. Nat. Hist. 2nd ser. viii. p. 162 (Sept. 1851).

[2] Dict. iv. p. 1.

[3] Linn. Trans. vol. xviii. p. 231, tab. 18.

[4] Page 593 *a* (1853), with comparative analytical figures of the structures of *Symplocos* and *Strigilia*, adding the differential characters of the two groups.

[5] Contrib. Bot. i. p. 159; Ann. Nat. Hist. 3rd ser. vol. iii. p. 129, Feb. 1859

The separation of the *Symplocaceæ* as suggested by Don was adopted by Endlicher in 1839[1], and by Miquel in 1856[2].

Prof. De Candolle, as we know, regarded *Symplocos*, in which he included all the recorded genera, as a mere tribe of the *Styraceæ*[3], a view subsequently adopted by Messrs. Bentham and Hooker[4] without offering any reasons.

In pursuit of our plan, we will now proceed to describe the several genera, which, according to the evidence adduced, constitute the order, describing the generic characters at full length, and supplementing each in their turn with a list of the species recorded by authors, with their synonyms and references.

Symplocos.

This genus was established by Jacquin in 1763[5], and adopted by Linnæus in the same year[6], by Schwartz in 1791[7], by Willdenow in 1800[8], by Lamarck in 1806[9]. Pohl, in 1831, published three species under the name of *Stemmatosiphon*[10], which he referred to *Meliaceæ*. Jussieu in 1830[11], commenting on that genus, showed that it does not belong to *Meliaceæ*. Mr. Bentham demonstrated in 1838[12] that the plants of Pohl were species of *Symplocos*.

Mr. Bentham derived his generic characters of *Symplocos* from a species found by Gardner (and by myself at the same time) in the Organ Mountains. His analysis made from the dried plant is quite in accord with that obtained by me from the living plant, as shown by me in Lindley's 'Veget. Kingdom,' *l. c.* p. 593 *a*, fig. 402. He correctly represents, in his plate referred to, five to seven petals agglutinated, as he saw them, and half-coherent into a tube; many stamens in three series half-agglutinated at their base into a tube semiadnate to the tube of the corolla; but if he had been able to examine the flower in a living state, he would have found that these parts could be separated easily without the least degree of laceration; in fact they are all at first free, and they owe their subsequent agglutination to a nectarial juice emitted by the disk.

1 Gen. p. 744 (exclus. *Schœpfia*).
2 In 'Flor. Brasil.' fasc. xvii. p. 22.
3 Prodromus, viii. p. 246.
4 Gen. Plant. ii. p. 668.
5 Pl. Amer. p. 166.
6 Sp. Pl. ii. 749.
7 Obs. p. 293, tab. 7.
8 Spec. Pl. ii. p. 1435.
9 Dict. vii. 524, tab. 455.
10 Pl. Bras. Icon. tab. 157, 158, 159.
11 Mem. Mus. xix. p. 304.
12 Linn. Trans. xviii. pp. 232, 233.

SYMPLOCOS, *Jacq.*, *Linn.*, *Benth.*, *A. De Candolle* (*ex parte*).
—Stemmatosiphon, *Pohl.*—Mongesia, *Velloz.*

Flores hermaphroditi. *Calyx* in alabastro omnino liber, 5-partitus, imo breviter campanulatus, lobis subrotundatis, parvis, tubo demum ad ovarium accreto. *Petala* 5–6–7 oblonga, primum libera, quincuncialiter paullissime imbricata, parte dimidia supera reflexa, glabra, demum pro dimidia parte inferiore a nectare cum staminibus ovarioque accreta. *Stamina* 20–50, in seriebus 3–4 erecta, imo enata; *filamenta* lineari-oblonga, compressa, tenuiter membranacea, apice subito in filum contracta, primum libera, dein nectare glutinoso in tubum pro majore parte agglutinata; *antheræ* globosæ, lobis 2 sine connectivo collateraliter adnatis, imo dorsi affixæ, erectæ, scabridulæ, latere dehiscentes; *pollen* minutum, trigone globosum. *Discus* majusculus, epigynus, umbilicatim pulvinatus, e sulcis circ. 20 crenatus, pellucide coloratus, pilis brevibus sparsim pilosus, persistens, *nectar* glutinosum exudens. *Stylus* filiformis, infra medium pilosus, staminibus paullo longior; *stigma* majusculum, semicupulare, margine 5–7-crenatum. *Ovarium* ovatum, per majorem partem inferum, disco calyceque coronatum, 5-loculare; *ovula* in quoque loculo 3–5, guttiformia, superposita, axi suspensa, anatropa. *Drupa* ovali-oblonga, majuscula, imo paullo angustata, calyce discoque superata; *pericarpium* rugoso-coriaceum, crassiusculum, fuscum; *nux* conformis, subtenuiter ossea, 5-loculata, loculis 1–2, raro abortivis, apice carunculis 5 loculis superpositis prædita; *dissepimenta* subcoriacea bilamellata, in angulis conniventia; *axis centralis* medullaris, vasis nutrientibus repletus; *semina* in loculis pauca, superposita, axi suspensa, guttiformi-oblonga aut subtrigonoidea; *integumentum* laxe membranaceum, cum *raphe* longitudinali; *embryo* in *albumine* sat copioso carnoso centralis, paullo curvula; *radicula* teres, elongata, supera; *cotyledones* 2 parvæ, suborbiculatæ, plano-convexæ, illi æquilatæ et triplo breviores.

Arbores aut suffrutices in *America calidiore, præsertim in Brasilia vigentes*; rami *alterni patentes*; folia *alterna, exstipulata, oblonga, integra vel serrata, petiolata*; racemi *breves, axillares*; flores *plures, rarius pauci, breviter pedicellati*; pedicelli *imo bibracteolati*.

1. SYMPLOCOS MARTINICENSIS, *Jacq. Amer.* p. 166, tab. 175. fig. 68 (flos); *Linn. Sp. Pl.* ii. p. 747; *L'Hérit. Linn. Trans.* i. p. 175; *Willd. Sp. Pl.* iii. p. 1435; *Pers. Syn.* ii. p. 74; *Gaertn. Fruct.* iii. p. 141, tab. 209. fig. 3; *Swartz, Obs.* p. 294, tab. 7; *Lam. Dict.* vii. p. 524, tab. 455. fig. 1; *A. DC. Prodr.* viii. p. 249. In Antillis: *non vidi.*

2. Symplocos Berterii, *nob.*—Symplocos martinicensis, var. Berterii, *A. DC. l. c.* p. 250. In Mexico: *non vidi.* Species, ut videtur, sat distincta.

3. S. bahiensis, *A. DC. l. c.* p. 280; *Miquel in Flor. Brasil.* fasc. xvii. p. 24, tab. 84. In Bahia: *non vidi.*

4. S. nitens, *Benth. in Linn. Trans.* xviii. p. 232; *A. DC. l. c.* p. 280; *Miquel in Fl. Bras. l. c.* p. 24, tab. 8. fig. 3. —Stemmatosiphon nitens, *Pohl, Icon. Bras.* ii. p. 38, tab. 158. In Brasilia et Venezuela: *v. s. in herb. meo* (19420), Rio Casiquiare (*Spruce* 3101).

5. S. platyphylla, *Benth. in Linn. Trans.* xviii. p. 233; *A. DC. l. c.* p. 251; *Mart. Syst. Mat. Med. Bras.* p. 48; *Flor. Bras. t. c.* p. 26, tab. 9, cum analys. floris.—Stemmatosiphon platyphyllum, *Pohl, l. c.* p. 87, tab. 157. In Brasilia: *v. s. in herb. meo* (18269), in prov. Minas Geraës (*Claussen* 226).

6. S. uniflora, *Benth. l. c.* p. 233; *A. DC. l. c.* p. 251; *Miquel in Flor. Bras. l. c.* p. 28.—Stemmatosiphon uniflorum, *Pohl, l. c.* p. 89, tab. 159. In Brasilia: *v. s. in herb. meo* (17373), prov. Minas Geraës (*Claussen*, 309).

7. S. laxiflora, *Benth. l. c.* p. 251, tab. 18; *A. DC. l. c.* p. 252; *Lindley, Veg. Kingd.* p. 593*a* (analysis); *Miquel in Fl. Bras. l. c.* p. 28.—Mongesia glabra, *Velloz, Fl. Bras.* p. 229; *Icon.* v. tab. 106. In Brasilia, montib. Organens.: *v. v. et sicco in herb. meo* (4396).

8. S. Lundii, *A. DC. l. c.* p. 251; *Miquel in Flor. Bras. l. c.* p. 25. In Brasilia: *v. s. in herb. meo* (18474), Minas Geraës (*Claussen* 236 *in parte*).

9. S. obovata, *Miquel in Fl. Bras. l. c.* p. 25; *A. DC. l. c.* p. 251. In Brasilia, prov. Rio de Janeiro: *v. s. in herb. meo* (4919), Cabo Frio (*ex herb. Martii*).

10. S. pycnobotrya, *Miquel in Flor. Bras. l. c.* p. 25. In Brasilia, prov. Espiritu Santo et Minas Geraës: *v. s. in herb. meo* (4675), Minas (*Claussen* 200).

11. S. pubescens, *Klotsch*; *Benth. l. c.* p. 233; *A. DC. l. c.* p. 282; *Miquel in Flor. Bras. l. c.* p. 26.—Mongesia pilosa, *Velloz, Fl. Flum.* 229; *Icon.* v. tab. 105. In Brasilia, prov. S. Paulo et Minas Geraës: *v. s. in herb. meo* (18475), *Claussen* 226.

12. Symplocos Clausseni, *A. DC. l. c.* p. 251; *Miquel in Flor. Bras. l. c.* p. 27. In Brasilia, prov. Minas Geraës (*Claussen* 226, *in parte*): *non vidi.*

13. S. Martii, *A. DC. l. c.* p. 252; *Miquel, in Flor. Bras. l. c.* p. 27. In Brasilia, prov. S. Paulo et Rio de Janeiro: *non vidi.*

14. S. parviflora, *Benth. l. c.* p. 232; *A. DC. l. c.* p. 252; *Miquel in Flor. Bras. l. c.* p. 27. In Brasilia, prov. Rio Grande do Sul et S. Paulo: *v. s. in herb. meo* 21889, prov. S. Paulo, Tibagi (*Weir* 414).

15. S. phæoclados, *A. DC. l. c.* p. 253; *Miquel in Fl. Bras. l. c.* p. 32, tab. 13. fig. 11.—Symplocos arbutifolia, *Casaretto, l. c.* p. 30. In Brasilia, prov. Minas Geraës: *non vidi.*

16. S. paraënsis, *Pöpp. & Endl.*—Symplocos Ciponima, *Miquel* (*non L'Hérit.*); *Miquel, Flor. Bras. l. c.* p. 23, tab. 8. fig 2, where the analysis proves it to be a true *Symplocos*, and not belonging to *Ciponima*. In Pará: *non vidi.*

Ciponima.

This genus, established by Aublet in 1775[1], was acknowledged by Cavanilles[2] in 1789, by Jussieu in 1789[3]. It was united with *Symplocos* by Willdenow in 1800[4], by Lamarck in 1811[5], and subsequently by all botanists, except Gaertner[6], who treated it as a distinct genus, a view which I fully support. This conviction is based upon the fact that its ovary bears an ascending ovule fixed in the base of each cell; the seeds in the ripe fruit are in like manner attached; and these bear an embryo reverse to its usual position, with an inferior radicle—circumstances not found in any other genus of the family. These circumstances, unobserved by others, are faithfully recorded by Gaertner in so clear, positive, and circumstantial a manner, well illustrated by corresponding figures, that no one has yet ventured to challenge their truth, if we except the very loose remark of DeCandolle concerning the above-mentioned figures ("ubi errore gravi"); but as he does not hint at the nature of this supposed error, no value whatever can be attached to the objection.

[1] Hist. des Pl. i. p. 566, tab. 226.
[2] Dissert. vii. p. 371, tab. 21.
[3] Gen. p. 157.
[4] Spec. Pl.
[5] Dict. Suppl. ii. p. 270.
[6] De Fruct. iii. p. 139, tab. 209.

CIPONIMA, *Aubl.*, *Cav.*, *Juss.*, *Gaertner.*—Symplocos, *in parte, auctor.*

Flores hermaphroditi, subparvi. *Calyx* pro dimidia parte ad ovarium connatus, limbi lobis 5, erectis, liberis, basi pluribracteatus. *Corolla* tubulosa; *tubus* calycem duplo superans, fauce coarctatus; *limbus* 5-partitus; *segmenta* oblonga, obtusa, patentia, æstivatione quincuncialiter imbricata, sæpe cum staminibus calyptratim decidua. *Stamina* circ. 30, subinæqualia, biserialia, exteriora sublongiora; *filamenta* pro dimidia parte inferiore in tubum monadelphum arcte agglutinata, hoc ad corollam connatum, omnia simul decidua, pro dimidia parte superiore libera, angustissime linearia et filiformia, ultra faucem divergentia; *antheræ* rotundatæ, striatæ, bilobæ, longitudinaliter dehiscentes. *Ovarium* semiinferum, rotundum, 4-loculare, loculis uniovulatis; *ovula* erecta, peculiariter ad basin affixa. *Stylus* subulatus. *Stigma* capitato-quadrilobum. *Drupa* ovato-oblonga, carne pulposa tecta. *Nux* ovata, striolata, ossea, durissima, 4- raro 5-locularis, loculis monospermis. *Semen* acuminato-subcylindricum, supra basin perspicue strumosum, basi affixum; *integumentum* fuscum, tenuiter membranaceum; *embryo* in *albumine* carnoso centralis; *radicula* infera, longissime et tenuiter teres, supra basin obtusam valde clavata, erecta; *cotyledones* 2, minimæ, superæ, acutæ, divergentes.

Arbores *in America tropicali vigentes, ramosæ*; flores *parvi*; folia *elliptica, breviter petiolata*; racemi *breves, pauciflori*; flores *parvi.*

1. CIPONIMA GUIANENSIS, *Aubl. Pl. Guyan.* i. p. 567, tab. 226; *Lam. Dict.* ii. p. 11; *Illustr.* tab. 455; *Cavan. Dissert.* iii. p. 337, tab. 217; *Gaertn. Fruct.* iii. p. 139, tab. 209. fig. 1.—Symplocos Ciponima, *Willd. Sp. Pl.* iii. p. 1435; *L'Hérit. Linn. Trans.* i. p. 175; *Meyer, Esseq.* p. 248; *A. DC. Prodr.* viii. p. 250. In Guiana: *non vidi.*

2. C. SCABRIDULA, *nob.*—Symplocos Ciponima, *A. DC.* (*non L'Hérit.*) *l. c. in parte*, p. 250. In Guiana Brit.: *v. s. in herb. meo* (9445), Guiana (*Schomb.* sub no. 383).

A species very different from that figured by Aublet or Cavanilles: its leaves are little more than half their length, are quite oval, with an extremely short, obtuse, apical contraction, fuscous green above, margin subrevolute and obsoletely denticulate, ochraceo- or croceo-opaque and densely punctulate-scabrid beneath.

The plant described and the analysis figured by Miquel in Flor. Bras. fasc. xvii. p. 23, tab. 8. fig. 2, as the *Ciponima* of Aublet, certainly does not belong to that genus; it is the *Symplocos paraënsis*, Pöpp. & Endl., enumerated in a preceding page (p. 287).

Protohopea.

The genus *Hopea* of Linnæus was incautiously repudiated by most botanists, who made it a section of *Symplocos*. Roxburgh, therefore, to preserve the memory of his friend Dr. Hope, applied this name to a genus of *Dipterocarpeæ*; and this is now too firmly established to allow of the correction of the error. Gaertner first described the peculiarities of this genus, which render it distinct from all others of the family, if we exclude from it all the Asiatic species referred to it by DeCandolle.

Thus restricted, the younger Gaertner gave an excellent analysis of this Linnean genus[1], demonstrating the unusual features that will prevent its fusion with any other member of the family. In order to prevent any misunderstanding, I propose to name it *Protohopea*, thus maintaining its prior right over the genus of Roxburgh.

Its generic diagnosis is here remodelled in the following manner.

Protohopea, *nob.*—Hopea, *Linn.*—Symplocos, sect. iv., *A. DC.* (exclus. sp. Asiat.).—Hopea, *Gaertn. fil.*

Flores parvi. *Calyx* campanulatus, semisuperus, limbo 5-dentato, dentibus oblongo-ovatis. *Petala* 5, oblonga, concava, imo connata. *Stamina* numerosa, petalis longiora, pentadelpha; *filamenta* setacea, in phalangibus 5 imo petalorum affixa; *antheræ* subglobosæ, quadrangulares. *Ovarium* semiinferum, in parte superiore lobis calycinis absconditum, 3-loculare, loculis uniovulatis. *Ovula* pendula. *Stylus* tenuis, superne crassior; *stigma* incrassatum. *Drupa* parva, ovata, vel elliptica, semiinfera, inferne pericarpio tenuiter carnoso tecta, vertice tantum dentibus calycinis circumdatis. *Nux* elliptica, crassiuscula, ossea, 3-locularis, loculis 2 sæpe abortientibus; *dissepimenta* membranacea, persistentia. *Semen* in loculo solitarium, guttiforme, apice acuto suspensum, imo rotundatum, lateribus planiusculis, dorso convexum, pro majore parte *arillo* carnoso saccato laxe vestitum; *integumentum proprium* tenuissime membranaceum. *Embryo* tereticylindricus, in *albumine* carnoso difformi oblongo centralis, curvulus; *radicula* longa, supera; *cotyledones* 2, brevissimæ, obtusæ, accumbentes, ad basin spectantes.

Arbusculæ *in Carolina et America centrali vigentes, ramosæ*; folia *alterna elliptico-oblonga, utrinque acuta, serrata, petiolata*; flores *parvi, in racemis novellis axillares, crebre spicati*, evolutione *præcoces*.

Observation.—It is right to mention here that Jussieu in his

[1] Fruct. iii. p. 140, tab. 209. fig. 2.

generic character of *Hopea* (Gen. p. 175) omits mention of its seed; but he adds "an corculum pericarpio inclusum?"

1. Protohopea tinctoria, *nob.*—Hopea tinctoria, *Linn. Mant.* i. p. 105; *Syst. Veget.* edit. 14, p. 609; *Catesb. Carol.* i. p. 54, tab. 54; *Pers. Syst.* ii. p. 74; *Juss. Gen.* p. 157; *Mich. Arb.* iii. p. 61, tab. 173; *Pursh, Fl. N. Amer.* ii. p. 451; *Nuttall, Gen.* ii. p. 183; *Ellis, Sp. Carol.* ii. p. 173; *Lam. Dict.* iii. p. 135; *Gaertn. Fruct.* iii. p. 140, tab. 209. fig. 2.—Symplocos tinctoria, *Willd. Sp. Pl.* iii. p. 1436; *L'Héritier, Linn. Trans.* i. p. 176; *A. DC. Prodr.* viii. p. 254. In America calidiore ad Carolinam: *non vidi.*

2. P. cernua, *nob.*—Symplocos cernua, *Benth.* (*non Bonpland*) *in Pl. Hartw.* p. 78.—Symplocos Hartwegi, *A. DC. l. c.* p. 252. In Guatemala ad Santa Maria (*Hartweg* 545): *non vidi.*

The *Hopea dichotoma* of Willdenow and Vahl appears to belong to *Dicliptera* in *Acanthaceæ*; it is near *D. bivalvis*, Juss., and is from Tranquebar (see Lam. Dict. Suppl. iii. p. 57).

Præalstonia.

The genus *Alstonia*, established by the younger Linnæus in 1781[1] upon a manuscript name given by Mutis, was acknowledged by Lamarck in 1783[2]; L'Héritier in 1790[3] united it with *Symplocos*; Willdenow in 1800 followed this example[4]; Bonpland in that year did the same[5]; Kunth in 1818 accepted this view[6]; it was made a section of *Symplocos* by DeCandolle in 1844[7]. In 1838, however, Mr. Bentham proposed to restore *Alstonia* as a good genus on account of its differential characters[8]; and I now propose to follow up his recommendation. But a difficulty here again occurs, as in the preceding genus. Rob. Brown in 1844, considering that *Alstonia* was repudiated[9], gave this name to a genus of the *Apocynaceæ*; and this view has been universally accepted by botanists. In following Mr. Bentham's recommendation, so strongly urged, I propose to give it the name of *Præalstonia*, in order to vindicate its prior title. Its leading features are:—a corolla of 8 or 10 segments, always alternately arranged, for the most part free and reflected, in 2 series, all united at the base into a short tube; the fruit is a dry drupe, crowned by the teeth of

[1] Suppl. Plant. p. 264. [2] Dict. p. 95. [3] Linn. Trans. i. p. 170.
[4] Sp. Plant. iii. p. 1436. [5] Plant. Æquin. i. p. 131, tab. 51.
[6] H. B. K. iii. p. 256. [7] Prodr. viii. p. 247. [8] Linn. Trans. xviii. p. 229.
[9] Mem. Wern. Soc. i. p. 75; A. DC. *l. c.* p. 408.

the calyx, enclosing a 3–5-locular osseous nut, each cell maturing 2 or more seeds: this shows that the genus approaches *Symplocos*.

PRÆALSTONIA, *nob.*—Alstonia, *Linn. fil.* (*non R. Br.*).—Symplocos *plerrorumque auct.*

Flores hermaphroditi. *Calyx* parvus, turbinatus, imo in tubum brevem ovario connatus; *limbus* 5-dentatus, dentibus ovatis parvis persistentibus, æstivatione quincuncialiter imbricatis. *Corolla* e petalis 8–10 æquilongis alternatim in series 2 dispositis, spathulatim oblongis, interioribus angustioribus, imo in tubum brevissimum laxe coalitis, apicibus reflexis. *Stamina* numerosa, in seriebus 3–4 gradatim longioribus imbricata, petala non excedentia; *filamenta* angustissime lineares, apice in filum contracta, imo in orbem monadelphum tubo corollæ accretum coalita; *antheræ* globosæ, 2-loculares, latere dehiscentes. *Ovarium* inferum, 3–5-loculare, *disco* 5-tuberculato superatum; *stylus* tenuis, corollæ æquilongus. *Stigma* crassum, obtuse 3–5-fidum. *Drupa* oblonga, dentibus calycinis discoque coronata, imo bracteolis imbricatis cincta; *pericarpio* subcarnoso. *Nux* conformis, ossea, 3–5-locularis, *dissepimentis* crassis durissimis, axi centrali tenui, medullari, e vasis nutrientibus farcto, loculis abortu monospermis. *Semen* suspensum; *integumentum* simplex, fuscum. *Embryo* anatropus, in *albumino* cartilagineo centralis, rectus; *radicula* supera, teres, elongata; *cotyledones* 2, parvæ, obtusæ, rotundatæ, ad basin spectantes.

Arbores aut suffrutices, *in America calidiore, plerumque Peruvianæ, ramosæ*; folia *alterna, elliptica, subserrata, petiolata.* Flores *plurimi, in axillis plus minusve congesti, pluribracteolati.*

1. PRÆALSTONIA THEÆFORMIS, *nob.*—Alstonia theæformis, *Linn. Suppl.* p. 264; *Lam. Dict.* i. p. 95.—Symplocos Alstonia, *L'Hérit. Linn. Trans.* i. p. 176; *Willd. Spec. Pl.* iii. p. 1436; *Bonpl. Pl. Æquin.* i. p. 181, tab. 51; *H. B. K.* iii. p. 257; *Pers. Syn.* ii. p. 74; *A. DC. Prodr.* viii. p. 247. In Nov. Granada: *non vidi.*

2. P. OCTOPETALA, *nob.*—Symplocos octopetala, *Sw. Prodr.* p. 106; *Flor. Ind. Occ.* iii. p. 1287; *Willd. l. c.* iii. p. 1456; *Pers. Syn.* ii. p. 74; *A. DC. l. c.* p. 249; *Lunan, Hort. Jam.* ii. p. 221. In Jamaica: *non vidi.*

3. P. ARECHEA, *nob.*—Symplocos arechea, *L'Hérit. l. c.* p. 176; *Willd. l. c.* p. 1435; *Bonpl. l. c.* p. 197; *G. Don, Dict.* iv. p. 2; *A. DC. l. c.* p. 250. In Peruvia: *non vidi.*

4. P. COCCINEA, *nob.*—Symplocos coccinea, *Bonpl. l. c.* p. 85, tab. 52; *H. B. K. l. c.* p. 258; *A. DC. l. c.* p. 249. In Mexico, prope Xalapam: *non vidi.*

5. PRÆALSTONIA MATTHEWSII, *nob.*—Symplocos Matthewsii, *A. DC. l. c.* p. 250. In Peruvia: *v. s. in herb. meo* (6713): Chachapoyas (*Matthews* 2016).

6. P. REFLEXA, *nob.*—Symplocos reflexa, *A. DC. l. c.* p. 248. In Peruvia: *non vidi.*

7. P. CERNUA, *nob.*—Symplocos cernua, *Bonpl.* (*non Benth.*) *Pl. Æquin.* i. p. 138, tab. 53; *H. B. K.* iii. p. 257; *A. DC. l. c.* p. 248; *Miq. in Fl. Bras.* fasc. xvii. p. 34. In Nov. Granada: *non vidi.*

8. P. SERRULATA, *nob.*—Symplocos serrulata, *Bonpl. l. c.* p. 190, tab. 54; *H. B. K. l. c.* p. 258; *A. DC. l. c.* p. 248. In Nov. Granada: *non vidi.*

9. P. RUFESCENS, *nob.*—Symplocos rufescens, *Bonpl. l. c.* p. 259; *A. DC. l. c.* p. 248. In Nov. Granada: *non vidi.*

10. P. TOMENTOSA, *nob.*—Symplocos tomentosa, *Bonpl. l. c.* p. 195; *H. B. K. l. c.* p. 260; *A. DC. l. c.* p. 249. In Nov. Granada: *non vidi.*

11. P. NUDA, *nob.*—Symplocos nuda, *Bonpl. l. c.* p. 195; *H. B. K. l. c.* p. 260; *A. DC. l. c.* p. 248. In Nov. Granada: *non vidi.*

12. P. MUCRONATA, *nob.*—Symplocos mucronata, *Bonpl. l. c.* p. 196; *H. B. K. l. c.* p. 261; *A. DC. l. c.* p. 258. In Nov. Granada: *non vidi.*

13. P. PARVIFOLIA, *nob.*—Symplocos parvifolia, *Benth. in Pl. Hartw.* p. 140; *Walp. Rep.* vi. p. 459. In Ecuador prope Loxam: *non vidi.*

14. P. CORIACEA, *nob.*—Symplocos coriacea, *A. DC. l. c.* p. 248; *Miq. in Fl. Bras. l. c.* p. 34. In Peruvia: *non vidi.*

The *Symplocos limoncillo*, placed by Bonpland in his section *Alstonia*, is *Styrax limoncillo*, Schlect. Linn. viii. 527.

BARBERINA.

This genus, established by Velloz in 1825, was regarded by Prof. A. DeCandolle, in 1844, as a mere section of *Symplocos*—a view generally accepted. It has, however, ample claims to be maintained as a good genus, as the following diagnosis shows.

BARBERINA, *Velloz*[1].—Epigenia, *in parte, Velloz*[2].—Symplocos sectio, *A. DC.*[3]; *Miquel*[4] *loco infra citato*; *Benth. & Hook.*[5].—Sympleura *et* Scyrtocarpa, *nob. olim*[6].

[1] Flor. Flum. p. 235.

[2] *Ibidem*, p. 183 (excl. *Epig. integerrima*, quæ est *Strigilia glabrata*, nob. Contrib. i. p. 186).

[3] Prodr. viii. p. 253.

[4] In Flor. Bras. fasc. xvii. p. 29.

[5] Gen. Pl. ii. p. 668.

[6] In Lindl. Veg. Kingd. p. 593 *a*.

Flores parvi, nunc hermaphroditi, sæpius polygamo-dioici. *Calyx* parvus, campanulatus, limbo 5-fido, persistens, demum auctus, et ad fructum laxe accretus. *Petala* 5, subparva, basi vix nexa, æstivatione quincuncialiter imbricata. *Stamina* 5 ad 30, sæpe subpentadelpha, basi petalorum inserta, glabra, in ☿ pauca, æquilonga, et uniserialia, in ♂ plurima, bi- triserialia, inæquilonga; *filamenta* subulata, subincurva; *antheræ* didymo-globosæ, dorso affixæ, longitudinaliter utroque latere dehiscentes; *pollen* minutum, globosum, tririmosum. *Discus* epigynus, annularis vel planiusculus. *Ovarium* imperfecte inferum, calyce sublibero tectum, 3 loculare; *ovula* in quoque loculo solitaria, suspensa. *Fructus* oblongus, vel oblongo-pyramidatus calyce aucto laxe tectus, lobis calycinis coronatus, siccus, indehiscens, apice disci rotundatus; *nux* conformis, tenuiter testacea, vix ossea, fragilis, abortu 1-locularis; *dissepimenta* membranacea, latere adpressa. *Semen* oblongum, dorso convexum, subcompressum, apicem versus sensim attenuatum, *funiculo* brevi suspensum; *integumentum* membranaceum, fuscum, raphe longitudinali notatum. *Embryo* in *albumen* carnosum sat copiosum immersus; *radicula* supera, tenuiter teres, paulo incurva; *cotyledones* 2, minutæ, inferæ.

Arbores aut suffrutices *plerumque Brasilienses, ramosæ*; folia *alterna, oblonga, sæpius subserrata, petiolata*; racemi *axillares, breves*; flores *parvi, pedicellati, bracteolati, sæpe spicatim congesti.*

Sectio 1. *Fructiferæ, flores hermaphroditi*[1].

1. B. LANCEOLATA, *nob.*—Symplocos lanceolata, *A. DC. Prodr.* viii. p. 253; *Miquel in Fl. Bras.* fasc. xvii. p. 29, tab. 10.—Symplocos oblongifolia, *Casaretto, Stirp. Bras. Decad.* p. 31; *A. DC. Prodr.* viii. p. 673. In Brasilia: *v. s. in herb. meo* (6048 et 18476), Minas Geraës (*Claussen*).

2. B. TETRANDRA, *nob.*—Symplocos tetrandra, *Mart. in Syst. Med. Bras.* p. 49; *Miquel in Flor. Bras. l. c.* p. 33, tab. 14. In Brasilia: *v. v. et sicco in herb. meo* (4556), in mont. Organens, fructu immaturo.

3. B. ESTRELLENSIS, *nob.*—Symplocos estrellensis, *Casaretto, l. c.* p. 32; *A. DC. l. c.* p. 673. In Brasilia, prov. Rio de Janeiro: *v. v. et sicc. in herb. meo* (4228 et 4554), in montib. Organens.

4. B. RHAMNIFOLIA, *nob.*—Symplocos rhamnifolia, *A. DC. l. c.* p. 253; *Miquel, l. c.* p. 33.—Symplocos variabilis, *Mart. in Flor. Bras. l. c.* p. 30, tab. 11. In Brasilia, prov. Rio de Janeiro et Bahia: *v. v. et sicc. in herb. meo* (4091), in flore, et abundans et in

[1] Pleræ olim ad genus *Scyrtocarpys*, nob. relatæ.

fructu: in montib. Organensibus. Specimen meum cum planta Bahiensi apte convenit.

Sectio 2[1]. Flores *irregulares, sæpe polygami*; calyx 4–5-*fidus, ciliatus*; petala 4–5, *sublibera, revoluta*; stamina 10–30, *bi- triserialia*, 4–5-*delpha, in ♂ longiora, in ⚥ breviora, cum stylo brevi*; ovarium 3-*loculare, interdum effœtum*; fructus *abortu monospermus*.

5. B. CRENATA, *nob.*—Epigenia crenata, *Velloz, For. Flum.* p. 184; *Icon.* iv. tab. 138. In Brasilia, prov. Rio de Janeiro: *v. v. et sicc. in herb. meo* (4553), montib. Organensibus: in pl. ♂ petala 4, stamina 12, inæqualia, 3-serialia, elongata; ovarium effœtum.

6. B. HIRSUTA, *Vell. l. c.* p. 235; *Icon.* v. tab. 117.—Symplocos hirsuta, *A. DC. l. c.* p. 253; *Miquel, Fl. Bras. l. c.* p. 33.—Symplocos arbutifolia, *Casar. l. c.* p. 30; *A. DC. l. c.* p. 673. In Brasilia, prov. Rio de Janeiro et Minas Geraë: *non vidi.*

7. B. CELASTRINEA, *nob.*—Symplocos celastrinea, *Mart. in Fl. Bras. l. c.* p. 31, tab. 12. In Brasilia, prov. Minas Geraë: *v. s. in herb. meo* (6336), *Gardner* 4996.

8. B. RAMENTACEA, *nob.*—Symplocos ramentacea, *Mart. in Fl. Bras. l. c.* p. 33. In Brasilia, prov. Goyaz: *non vidi.*

9. B. REVOLUTA, *Mart.*—Symplocos revoluta, *A. DC. l. c.* p. 253; *Casar. l. c.* p. 31, et *A. DC. l. c.* p. 675. In Brasilia, prov. Minas et Rio de Janeiro: *v. v. et sicc. in herb. meo* (4555), in montib. Organsib.

10. B. CUBENSIS, *nob.* In Cuba: *v. s. in herb. meo* (13170), Cuba (*Linden* 2089).

A species with the habit of *B. crenata*, but with solitary flowers in the lower axils of the fallen leaves; stamens numerous, triserial, as long as the 5 petals.

11. B. ANTILLANA, *nob.*—In Antillis: *v. s. in herb. meo* (18123), Cuba (*Linden* 1831).

A species with the habit of *C. celastrinea.* Flowers 2–3, with many basal bracts on short axillary racemes scarcely longer than the petioles; petals 5, stamens 10, of the same length; stigma 3-lobed.

[1] Olim gen. *Symplcura*, nob. Concerning this section, Prof. DeCandolle observes (*l. c.* p. 673):—"Ob flores polygamos numerumque staminorum in fl. ♂ et ⚥ diversum, peculiarem sectionem in genere *Symplocos* constituere poterunt."

12. B. SPRUCEANA, *nob.*—Symplocos sp., *Benth. MSS.* In Peruvia: *v. s. in herb. meo* (21534), Tarapota (*Spruce* 4865).

Flores ♂ plures, spicatim racemosi; *calyx* 4-fidus; *petala* 4, triplo longiora, basi vix nexa; *stamina* 12, inæqualia, imo submonadelpha. *Flores* ♀ majores, in axillis solitarii in eodem ramo, *perula*[1] involucrati.

DECADIA.

A genus established by Loureiro in 1793, acknowledged by Lamarck in 1811[2], but scarcely recognized by other botanists. Prof. DeCandolle, in 1844, regarded it as a section of *Symplocos*[3]. The authors of the 'Genera Plantarum' looked upon it as a genus of *Symplocaceæ* of uncertain position[4]. To me it appears to offer characters that will maintain its validity: among these are its trifid calyx, a corolla with double the usual number of petals, which are biserial and unequal; this latter circumstance makes it approach the *Alstonia* of Linnæus.

DECADIA, *Lour.*[5]

Flores hermaphroditi. *Calyx* inferus, persistens, profunde 3-fissus, *laciniis* subrotundis, carnosulis, inæqualibus, pilosis, patentibus. *Petala* 10, biseriata, exteriora latiora, subovata, subserrata, erecta, calyce longiora. *Stamina* circ. 30, petala subæquantia, corollæ basi insidentia; *antheræ* subrotundæ, bilobæ, erectæ. *Ovarium* subrotundum, fere superum; *stylus* filiformis, stamina æquans; *stigma* crassiusculum. *Drupa* parva, ovata, rugosa; *nux* ovata, trilocularis.

Arbor *Chinensis, mediocris*; rami *patentes*; folia *alterna, lanceolata, serrata, petiolata*; racemi *parvi, subsimplices, terminales*; flores *minuti, albi.*

1. D. ALUMINOSA, *Lour. Coch.* i. p. 385; *Spreng. Syst.* ii. p. 602; *Rumph. Amboyn.* vol. iii. lib. v. cap. xv. p. 160, tab. 100.—Bobua, *Burm.* (*non Adans.*) *Zeylan.* p. 26. In Cochin China: *non vidi.*

The plant is well figured and described by Rumph.

DRUPATRIS.

A genus established by Loureiro in 1793, and also acknowledged by Lamarck in 1811[6], but which has been generally neglected by botanists. Prof. DeCandolle was disposed to refer it to *Symplocos*[7]; but it appears to me to present good claims as a valid genus.

[1] Mirbel, Elem. ii. p. 635, tab. 18. figs. 1, 2, 4.
[2] Dict. Suppl. ii. p. 459.
[3] Prodr. viii. p. 247.
[4] Genera Pl. ii. p. 668.
[5] Coch. i. p. 385.
[6] Dict. Suppl. ii. p. 526.
[7] Prodr. viii. p. 247.

Drupatris, *Lour.*[1]

Flores hermaphroditi. *Calyx*[2] campanulatus, superus, limbo 5-fido, laciniis acutis. *Petala* 4, subrotunda, concava, patentia, calyce sublongiora. *Stamina* ultra 20, petalis breviora, calyci insidentia; *filamenta* crassa; *antheræ* subrotundæ, bilobæ, erectæ. *Ovarium* subrotundum; *stylus* crassus, stamina æquans; *stigma* crassiusculum. *Drupa* ovalis, lævis, exsucca; *nux* trilocularis; *semina* in quoque loculo solitaria ("drupa quasiternaria, quæ 3 nucleos continet"). *Cætera* ignota.

1. D. cochinchinensis, *Lour. l. c.* p. 385.

Arbor magna, ramis paucis, adscendentibus; foliis alternis, magnis, ovato-oblongis, acuminatis, serratis, glabris; racemo subterminali, spicatim oblongo, multifloro; floribus parvis, albis. Drupa mediocris, non edulis.

In Cochin China in sylvis: *non vidi.*

Dicalix.

A genus established by Loureiro in 1793[3]. Lamarck acknowledged it in 1811[4]. Blume in 1826[5] united *Decadia* with it; but as it does not appear that he saw either plant, his determination is of no value. It differs from all others of the family in having each flower supported within a trifid involucellum, in the extreme number of its stamens, and in its ampulliform fruit, in which respect it approaches *Bobua.*

Dicalix, *Lour.*

Flores polygami, ♀ in distincta planta. *Involucellum*[6] triphyllum, foliolis acutis inflexis persistens. *Calyx* extus insitus, brevis, 5-dentatus, persistens. *Corolla* rotata, 5-partita; *segmenta* ovata, calyce longiora. *Stamina* fere 100, corollæ insidentia et ipsa longiora; *filamenta* capillaria; *antheræ* subrotundæ, biloculares. *Ovarium* subrotundum; *stylus* crassus, turbinatus, staminibus brevior; *stigma* obtusum. *Drupa* parva, involucello suffulta, calycis lobis coronata; *nux* ovata, collo, constricta 1-locularis.

1. D. cochinchinensis, *Lour. Coch.* ii. p. 816; *Lam. Dict. Suppl.* ii. p. 569; *Spreng. Syst.* ii. 568.—Arbor redeviva, *Rumph. Amboyna,* vol. iii. lib. v. cap. xix. tab. 104. In Cochin China: *non vidi.*

[1] Coch. i. p. 384.
[2] *Perianthium,* Lour.
[3] Coch. ii. p. 815.
[4] Dict. Suppl. ii. p. 471.
[5] Bijdr. p. 1116.
[6] Calyx exterior, *Lour.*

PALURA.

This Asiatic genus was first described in 1839 by G. Don as a distinct section of *Symplocos*[1]; Bentham in 1841 recognized this view[2]; DeCandolle adopted the same conclusion in 1844[3], with a more defined character. *Palura* should stand independently as a genus differing from all others of the family in its bilocular ovary and fruit. It may be thus defined:—

PALURA, *G. Don (non Ham.)*.

Flores hermaphroditi. *Calyx* urceolatus, semiinferus, semiquinquefidus, lobis acutis, patentibus. *Corolla* tubularis, semiquinquefida; *segmenta* ovata, concava. *Stamina* 30–60, tubo corollæ inserta, inæqualia, triseriata, segmenta non excedentia. *Ovarium* rotundato-oblongum, *disco* biglanduloso et pyramidato superatum, biloculare, *ovula* in quoque loculo pauca, superposita, pendentia. *Stylus* filiformis, longitudine petalorum; *stigma* clavato-bilobum. *Fructus* baccatus, rotundato-oblongus, calycis limbo discoque coronatus; *nux* conformis, bilocularis (raro abortione 1-locularis), axi medulla vasorum nutrientium perforata; *semina* in loculis pauca, ovata, pendula.

Arbusculæ *Asiaticæ, ramosæ*; folia *alterna, oblonga, integra, petiolata*; flores *in axillis pauci vel solitarii, parvi.*

1. P. SINICA, *nob.*—Symplocos sinica, *Ker, Bot. Reg.* tab. 710; *G. Don, Dict.* iv. p. 3, *cum icone*; *A. DC. Prodr.* viii. p. 258.—Myrtus chinensis, *Lour. Coch.* i. p. 383. In China: *non vidi.*

2. P. PENDULA, *nob.*—Symplocos pendula, *R. Wight, Icon.* iv. tab. 1237; *Thwaites, Enum.* p. 184. In Indiæ montib. Pulwai (Carnatic) et Ceylon: *non vidi.*

LODHRA.

So called from the vernacular name of *Symplocos racemosa*, Roxb., one of its species. The name was first selected by D. Don in 1825[4] to designate a section of *Symplocos*; this was adopted by G. Don in 1837[5]; it was described by Guillemin in the same year[6]; it was placed among the Asiatic species of *Hopea* by DeCandolle in 1844[7]; but was not proposed as a distinct genus until 1847, when Decaisne did so[8], founded on its type the *Symplocos cratæ-*

[1] Dict. iv. p. 3, in parte.
[2] Linn. Trans. xviii. p. 229.
[3] Prodr. viii. p. 258.
[4] Flor. Nepal. p. 145.
[5] Dict. iv. p. 2.
[6] Ann. Sc. Nat. ser. 2, vol. xv. p. 158.
[7] Prodr. viii. p. 253.
[8] Voy. Jacquinot, p. 103.

goides, D. Don. The species, 51 in number, are all of Asiatic origin. The genus differs from *Palura* in its trilocular ovary and fruit, and many other characters.

LODHRA, *Decaisne*.—Symplocos (*in parte*) *auctorum*.

Flores hermaphroditi. *Calyx* parvus, campanulatus, 5-dentatus, dentibus obtusis, imo pluribracteolatus. *Corolla* tubulosa, semiquinquefida; *segmenta* oblonga, quincuncialiter imbricata. *Stamina* numerosa, inæqualia, triseriata, tubo corollæ inserta, et hac subbreviora; *antheræ* oblongo-ovatæ, 2-lobæ, margine dehiscentes; *stylus* filiformis; *discus* epigynus, conicus, sæpe pilosus; *stigma* subcapitatum. *Ovarium* subinferum, *disco* carnoso superatum, triloculare; *ovula* plura vel pauciora, sæpius 4 in quoque loculo superposita, axi suspensa. *Fructus* baccatus, ovatus aut oblongus, calycis limbo discoque coronatus; *nux* ovata, apicem versus contracta, rugoso-striata, crasse ossea, abortu unilocularis et monosperma, *dissepimentis* membranaceis ad parietem adpressis, rarius bilocularis et disperma. *Semen* oblongo-cylindricum, utrinque obtusum; *embryo* in *albumine* copioso teres, paullo curvatus; *radicula* oblonga, supera, *cotyledones* 2, inferæ, lineares, illa dimidio breviores et æquilatæ, rarius longiores.

Arbores, suffruticesve *Asiaticæ, ramosæ*; folia *elliptica aut lanceolata, integra vel serrulata, petiolata*; racemi *axillares*; flores *plures, parvi*.

1. L. CRATÆGOIDES, *Decaisne in Jacquinot Voy.* p. 108, tab. 110.—Symplocos cratægoides, *D. Don, Flor. Nepal.* p. 145; *G. Don, Dict.* iv. p. 3; *A. DC. Prodr.* viii. p. 258.—S. paniculata, *Wall. Cat.* 4429.—Palura odorata, *Ham. in Herb.* In India: *v. s. in herb. meo* (17615), Khasya (*Griffiths*).

2. L. LOHU, *nob.*—Symplocos Lohu, *D. Don, Flor. Nepal.* p. 144; *G. Don, Dict. l. c.* p. 2; *A.DC. l. c.* p. 255.—S. lucida, *Wall.* (*non Brogn. & Gris.*) *Cat.* 4414. In India: *v. s. in herb. meo* (7614 et 19534), Khasya (*Griffiths*).

3. L. SAMUNTIA, *nob.*—Symplocos Samuntia, *D. Don, l. c.* p. 145; *G. Don, l. c.* p. 2 (excl. synon.); *A. DC. l. c.* p. 255. In India: *v. s. in herb. meo* (15557), Malacca (*Griffiths*).

4. L. RACEMOSA, *nob.*—Symplocos racemosa, *Roxb. Flor. Ind.* ii. p. 539, vern. *Lhodra*; *G. Don, Dict.* iv. p. 3; *A. DC. l. c.* p. 255. —S. theæfolia, *D. Don, l. c.* p. 144; *G. Don, l. c.* p. 2; *Kurz in Flor. Brit. Burma*, ii. p. 144. In Bengalia et Burma: *non vidi*.

5. L. SPICATA, *nob.*—Symplocos spicata, *Roxb. Flor. Ind.* iii. p. 541; *A. DC. l. c.* p. 254 (excl. synon. et var. β); *Wight, Illustr.*

p. 11, tab. 150; *Thwaites, Enum.* p. 184; *Kurz, l. c.* p. 146. In prov. Madras et Martaban: *v. s. in herb. meo* (15050), Neilgherries (*Gardner*).

6. LODHRA GRANDIFLORA, *nob.*—Symplocos grandiflora, *A. DC.* (*ex Wall. Cat.* 4421) *l. c.* p. 257. In India: *v. s. in herb. meo* (17614 et 19834), Khasya (*Griffiths*).

7. L. LUCIDA, *nob.*—Symplocos lucida, *A. DC.* (*non Brogn. & Gris., nec Sieber & Zucc.*) *l. c.* p. 255; *G. Don, Dict.* iv. p. 3; *Kurz in Flor. Brit. Burma*, ii. p. 143. In montib. Sylhet et Martaban: *non vidi.*

8. L. ATTENUATA, *nob.*—Symplocos attenuata, *A. DC.* (*ex Wall. Cat.* 4426) *l. c.* p. 256. In montib. Sylhet: *non vidi.*

9. L. HAMILTONIANA, *nob.*—Symplocos Hamiltoniana, *G. Don, Dict.* iv. p. 3; *A.DC.* (*ex Wall. Cat.* 4420) *l. c.* p. 254.—S. rigida, *Wall. Cat.* 4422, *sub* Decadia racemosa, *Ham. MSS.* In India, prope Molmein: *non vidi.*

10. L. RUBIGINOSA, *nob.*—Symplocos rubiginosa, *A. DC.* (*ex Wall. Cat.* 4432) *l. c.* p. 257. In ins. Penang et Ceylon: *v. s. in herb. meo* (14177); Ceylon (*Gardner* 542).

11. L. FERRUGINEA, *nob.*—Symplocos ferruginea, *Roxb. Flor. Ind.* ii. 542; *G. Don, l. c.* p. 2; *A. DC. l. c.* p. 257 (excl. synon.). In Sylhet et Penang: *non vidi.*

12. L. MACROPHYLLA, *nob.*—Symplocos macrophylla, *A. DC.* (*ex Wall. Cat.* 4431) *l. c.* p. 257. In Nepalia: *non vidi.*

13. L. FLORIBUNDA, *nob.*—Symplocos Samuntia, var. floribunda, *A. DC. l. c.* p. 253; *G. Don* (*ex Wall. Cat.* 4419) *l. c.* p. 3. In Nepalia: *non vidi.*

14. L. RAMOSISSIMA, *nob.*—Symplocos ramosissima, *G. Don, l. c.* p. 3; *A. DC. l. c.* p. 257. In Nepalia: *non vidi.*

15. L. NERVOSA, *nob.*—Symplocos nervosa, *A. DC. l. c.* p. 256; *Wight, Icon.* tab. 1235.—S. racemosa, *Wall.* (*non Roxb.*) *in Cat.* 4418. In Nepalia: *non vidi.*

16. L. PYRIFOLIA, *nob.*—Symplocos pyrifolia, *G. Don, l. c.* p. 3, *ex Wall. Cat.* 4415; *A. DC. l. c.* p. 256.—S. obtusa, *Thwaites* (*non A. DC.*), var. obovata, *Enum.* p. 185. In Ceylonia: *v. s. in herb. meo* (14174), Newera Ellia (*Gardner* 538).

17. Lodhra obtusa, *nob.*—Symplocos obtusa, *A. DC.* (*ex Wall. Cat.* 4424) *l. c.* p. 255; *Wight, Icon.* tab. 1233, *Spicilegia*, tab. 146; *Walp. Ann.* iii. p. 16; *Thwaites, l. c.* p. 185 (excl. synon.). In India et Ceylon: *v. s. in herb. meo* (15049), Neilgherries (*Gardner*).

18. L. Gardneriana, *nob.*—Symplocos Gardneriana, *Wight, Icon.* tab. 1231, *Spicilegia*, ii. tab. 144; *Walp. Ann.* i. p. 499, ii. p. 16. In Neilgherries: *v. s. in herb. meo* (15053), Ootacamund (*Gardner*).

19. L. foliosa, *nob.*—Symplocos foliosa, *Wight, Icon.* tab. 1234; *Walp. Ann.* i. p. 499. In Neilgherries: *non vidi*; speciei præced. affinis.

20. L. microphylla, *nob.*—Symplocos microphylla, *Wight, Icon.* tab. 1232, *Spicilegia*, tab. 145; *Walp. Ann.* i. p. 499. In Neilgherries et Ceylon: *v. s. in herb. meo* (14171), Newera Ellia (*Gardner* 535).

21. L. monantha, *nob.*—Symplocos monantha, *Wight, Icon.* tab. 1236; *Walp. Ann.* i. p. 500. Ad Courtallam: *non vidi.*

22. L. polystachya, *nob.*—Symplocos polystachya, *A. DC.* (*ex Wall. Cat.* 4428), *l. c.* p. 254. In India: *v. s. in herb. meo* (19805); Mergui (*Griffiths*).

23. L. oxyphylla, *nob.*—Symplocos oxyphylla, *A. DC.* (*ex Wall. Cat.* 4430) *l. c.* p. 256. In montib. Sylhet et Khasya: *v. s. in herb. meo* (17617), Khasya (*Griffiths*).

24. L. leiostachya, *nob.*—Symplocos leiostachya, *Kurz in Flor. Brit. Burma*, ii. 144. In Burma: *non vidi.*

25. L. sulcata, *nob.*—Symplocos sulcata, *Kurz, l. c.* p. 145. In Martaban: *non vidi.*

26. L. pedicellata, *nob.*—Symplocos pedicellata, *Kurz, l. c* p. 147. In prov. Martaban: *non vidi.*

27. L. leucantha, *nob.*—Symplocos leucantha, *Kurz, l. c.* p. 148. In sylvis inundatis fluv. Irawadi: *non vidi.*

28. L. pulchra, *nob.*—Symplocos pulchra, *Wight, Icon.* tab. 1230, *Spicilegia*, tab. 145; *Walp. Ann.* i. 499. In India: *v. s. in herb. meo* (15051), Neilgherries (*Gardner*).

29. L. caudata, *nob.*—Symplocos caudata, *A. D.C.* (*ex Wall. Cat.* 4413) *l. c.* p. 256; *Kurz, l. c.* ii. p. 147. In India: *v. s. in herb. meo* (17616), Khasya (*Griffiths* 307).

30. LODHRA POLYCARPA, *nob.*—Symplocos polycarpa, *G. Don, Dict.* iv. p. 3, *ex Wall. Cat.* 4423; *A. DC. l. c.* p. 255; *Kurz, l. c.* p. 146. In Khasya et Martaban: *v. s. in herb. meo* (19833), Khasya (*Griffiths*).

31. L. BRACTEALIS, *nob.*—Symplocos bractealis, *Thwaites, Enum.* p. 185. In Ceylonia: *v. s. in herb. meo* (14176), Newera Ellia (*Gardner* 541).

32. L. OBOVATA, *nob.*—Symplocos obovata, *Wight & Gardner in herb.*—Symplocos obtusa, var. obovata, *Thwaites, l. c.* p. 185. In Ceylonia: *v. s. in herb. meo* (14175), Elephant plains (*Gardner* 539).

33. L. CUCULLATA, *nob.*—Symplocos obtusa, var. cucullata, *Thwaites, l. c.* p. 185. In Ceylonia: *v. s. in herb. meo* (14173), Newera Ellia (*Gardner* 537).

34. L. HIRSUTA, *nob.*—Symplocos hirsuta, *Wight & Gardn. in herb.*; *Thwaites, l. c.* p. 185. In Ceylonia: *v. s. in herb. meo* (14172), Newera Ellia (*Gardner* 536).

35. L. HISPIDULA, *nob.*—Symplocos hispidula, *Thwaites, l. c.* p. 186. In Ceylonia: *non vidi.*

36. L. RUFESCENS, *nob.*—Symplocos rufescens, *Thwaites, l. c.* p. 184. In Ceylonia: *non vidi.*

37. L. LÆTA, *nob.*—Symplocos læta, *Thwaites, l. c.* p. 184. In Ceylonia: *non vidi.*

38. L. ELEGANS, *nob.*—Symplocos elegans, *Thwaites, l. c.* p. 185. In Ceylonia: *non vidi.*

39. L. JUCUNDA.—Symplocos jucunda, *Thwaites, l. c.* p. 186. In Ceylonia: *non vidi.*

40. L. ACUTA, *nob.*—Symplocos acuta, *Thwaites, l. c.* p. 186. In Ceylonia: *non vidi.*

41. L. CUNEATA, *nob.*—Symplocos cuneata, *Thwaites, l. c.* p. 186. In Ceylonia: *non vidi.*

42. L. CORDIFOLIA, *nob.*—Symplocos cordifolia, *Thwaites, l. c.* p. 187. In Ceylonia: *non vidi.*

43. L. MARGINALIS, *nob.*—Symplocos marginalis, *Thwaites, l. c.* p. 187. In Ceylonia: *non vidi.*

44. Lodhra apicalis, *nob.*—Symplocos apicalis, *Thwaites, l. c.* p. 187. In Ceylonia: *non vidi.*

45. L. coronata, *nob.*—Symplocos coronata, *Thwaites, l. c.* p. 187. In Ceylonia: *non vidi.*

46. L. Verhuelli, *nob.*—Symplocos Verhuelli, *Jungh. & Vriese, Pl. Nov. Ind. Batav.* i. p. 12; *Walp. Rep.* vi. p. 458. In Sumatra et Java: *non vidi.*

47. L. ribes, *nob.*—Symplocos ribes, *Jungh. & Vriese, l. c.* p. 11; *Walp. Rep.* vi. p. 458. In Java: *non vidi.*

48. L. xanthophylla, *nob.*—Symplocos xanthophylla, *Jungh. & Vriese, l. c.* p. 11; *Walp. Ann.* vi. p. 458. In Java: *non vidi.*

49. L. microcarpa, *nob.*—Symplocos microcarpa, *Champion in Kew Journ. Bot.* iv. p. 303. In Hongkong (*Champion*): *non vidi.*

50. L. crassifolia, *nob.*—Symplocos japonica, *Benth.* (*non A. DC.*) *in Kew Journ. Bot.* iv. p. 308. In Hongkong (*Champion*): *non vidi.*

Evidently a distinct species.

51. L. javanica, *nob.*—Symplocos javanica, *Kurz in Flor. Brit. Burma*, ii. 145. In Burma (Tenasserim) et insulis Malayanis usque Java: *non vidi.*

Leaves lanceolate or oblong-lanceolate, acute at both ends, rusty pergamineous, serrulate, covered with a rusty pubescence, 5–8 in. long, on a densely pubescent petiole 6–9 lines long; branching axillary racemes; flowers pubescent, 1 line long; ovary 3-locular; drupe ovoid, 3 lines long; nut ovate, contracted towards the apex, 1-seeded.

Bobua.

The history of this extensive genus is somewhat complicated. It was first established by the elder De Candolle in 1828, who placed it in *Combretaceæ*, from a fancied resemblance of its typical species to *Bruguiera*[1]. This type was the *Bobu* of Adanson and the *Eugenioides* of Linnæus; and it obtained from various authors many synonyms, which further complicated the matter. Prof. De Candolle, perceiving the mistake of his father, rightly placed the genus in *Symplocaceæ* in 1844, but as a mere synonym of *Symplocos*[2]. Its species, of Asiatic growth, are all of insular

[1] Prodr. iii. p. 28. [2] Prodr. viii. p. 246.

origin, the localities extending from Ceylon to Japan and the islands of New Caledonia. The genus differs from *Lodhra* in the following characters:—in its comparatively smaller corolla; in its more numerous stamens in 4–5 series, united at their base into 5 fasciculated bundles, shortly cohering below, and fixed upon the short tube of the corolla; in its scabrid anthers; in its pilose filiform style; in its ventricose ovary bearing a single suspended ovule in each cell; in its epigynous disk, which is crenately annular, umbilicate and striated within; in its baccate fruit, corrugated, fleshy, often of a bright blue colour; in its testaceous ampulliform nut, which is 3-celled, divided by fungous dissepiments meeting in the axis, and there perforated in the embryo of its albuminous seed, having a more slender and more elongated radicle with two minute inferior cotyledons.

The following is an amended diagnosis.

BOBUA, *De Candolle.*—Bobu, *Adans.*; *Hermann.*—Eugenioides, *Linn.*—Symplocos (*in parte*) *auctt.*—Chasseloupia, *Vieillard.*

Flores hermaphroditi. *Calyx* parvus, turbinatus, ad medium 5-fidus, lobis brevissime acutis, membranaceis, ciliatis, persistens. *Petala* 5, calyce 2–3plo longiora, lobis calycinis alterna, obovata, imo breviter cohærentia, rotata. *Stamina* circa 50, petalis vix longiora, tubo brevi corollæ insita, sæpius breviter pentadelpha, superne libera; *filamenta* subimbricata, late lineari-oblonga, valde reticulata, membranacea, apice subito in filum constricta; *antheræ* didymo-globosæ, scabridulæ. *Discus* epigynus, crenato-annularis, umbilicatus, intus striatus. *Ovarium* turbinatum, subinferum, disco coronatum, triloculare; *ovula* in quoque loculo solitaria, suspensa. *Stylus* petalis longitudine, æqualis filiformis, 5-angulatus, pilosus; *stigma* trigonum, capitatum. *Fructus* ovatus, baccatus, sæpe coloratus, corrugosus, disco lobisque calycinis coronatus; *nux* ovatus, collo constricta et hinc ampullæformis, testacea, trilocularis; *dissepimenta* fungosa, mollia, in axi pro vasibus nutrientibus perforata. *Semina* sæpe 1 vel 2 abortiva; *integumentum* membranaceum; *embryo* in *albumine* copioso carnoso tenuiter teres, paullo curvatus: *radicula* supera, elongata; *cotyledones* 2, minimæ, obtusæ, inferæ.

Arbores, *sæpius* arbusculæ, *in insulis Asiaticis vigentes, ramosæ*; folia *elliptica vel oblonga, integra aut serrata, petiolata*; racemi *breves, pauciflori*; flores *parvi.*

§ 1. *Species Asiaticæ.*

1. BOBUA LAURINA, *DC. Prodr.* iii. p. 23 (1828).—Bobu Bemba, *Paul Hermann, in Mus. seu Cat. Pl. Zeylan.* (1714); *Linn.*

Flor. Zeyl. p. 621 (1714).—Bobu, *Joh. Burmann, Thes. Zeyl.* p. 26 (1737).—Eugenioides, *Linn. Fl. Zeyl.* (*ex pl. Burm.*), p. 192 (1747); *Lam. Dict. Suppl.* i. p. 646 (1810).—Laurus serrata, *Joh. Burmann, Thes. Zeyl.* p. 139, tab. 62 (1737)—Myrtus serrata, *König* (1768).—Myrtus laurina, *Retz. Obs.* iv. p. 27 (1787).—Eugenia laurina, *Willd. Syst.* ii. p. 967 (1799).—Symplocos spicata, *A. DC.* (*non Roxb.*), var. zeylanica, *ex Wall. Cat.* 4427, *Prodr.* viii. p. 257. In Ceylonia: *v. s. in herb. meo* (14170), Galle (*Gardner* 534).

2. Bobua cerasifolia, *nob.*—Symplocos cerasifolia, *A. DC. l. c.* p. 257, *ex Wall. Cat.* 4434. In insula Penang et prov. Madras: *v. s. in herb. meo* (15052), Neilgherries (*Gardner*, in flore); fructus *non vidi.*

A species closely approaching the preceding.

3. B. oligostachya, *nob.*—Symplocos spicata, *A. DC.* (*non Roxb.*), var. oligostachya, *l. c.* p. 234.—Eugenia laurina, *Willd. in herb.* (*non in Syst.* ii. p. 967); *Wall. Cat.* 4416, cum nom. citato: *non vidi.*

A species near *B. laurina*, with few simple flowers, on a raceme scarcely longer than the petiole.

4. B. atroviridis, *nob.*—Symplocos spicata, *A. DC.* (*non Roxb.*), var. atroviridis, *l. c.* p. 234, *in Wall. itin. ined.* In Burma, (Tavoy, Moulmein, et Amherst): *non vidi.*

A species differing notably from *B. laurina* in the form and peculiar colour of its entire leaves.

§ 2. *Species Neo-Caledonicæ*[1].

5. B. stravadioides, *nob.*—Symplocos stravadioides, *Brongniart et Gris, Ann. Sci. Nat.* ser. 5, vol. vi. p. 246.—Chasseloupia neo-caledonica, *in parte, Vieillard in Bull. Soc. Linn. de Normandie*, vol. xiii. p. 429: *v. s. in herb. Soc. Linn. Normand.* montibus de Balade (*Vieillard* no. 541).

6. B. Lenormandiana, *nob.*—Symplocos Lenormandiana,

[1] The typical specimens of the species recorded in this section were kindly lent to me for examination by Prof. Morière, of the Linn. Soc. of Normandy. I made tracings of these, which are preserved in my herbarium, and which will serve for future reference.

Brongn. & Gris, l. c. p. 247.—Symplocos lanceæfolia, *Brongn. MSS.* —Chasseloupia neo-caledonica, *Vieill. in parte, l. c.* p. 248. *V. s. in herb. citato,* in montibus circa Wagap (*Vieill.* n. 543 et 2920).

7. Bobua Vieillardi, *nob.*—Symplocos Vieillardi, *Brongn. & Gris, l. c.* p. 248.—Chasseloupia cærulescens, *Vieill. in parte, MSS. V. s. in herb. citato,* circa Poila (*Vieill.* n. 542 et 2919).

8. B. cærulescens, *nob.*—Symplocos cærulescens, *Brongn. & Gris, l. c.* p. 247.—Chasseloupia cærulescens, *Vieill. l. c.* p. 430. *V. s. in herb. citato,* circa Wagap (*Vieillard,* 542 *bis*).

9. B. arborea, *nob.*—Symplocos arborea, *Brongn. & Gris, l. c.* p. 248.—Chasseloupia arborea, *Vieill. l. c.* p. 429. *V. s. in herb. citato,* circa Balade et Wagap (*Vieill.* n. 545).

10. B. glaucescens, *nob.*—Symplocos glaucescens, *Vieill. MSS.*—Chasseloupia lucida, *in parte, Vieill. l. c.* p. 430. *V. s. in herb. citato,* Wagap (*Vieill.* n. 2921).

11. B. rotundifolia, *nob.*—Symplocos rotundifolia, *Brongn. & Gris, l. c.* p. 248.—Chasseloupia nitida, *Vieill. MSS.*; *Deplanche, MSS.* n. 60. *V. s. in herb. citato* (*Vieill.* n. 491 *bis,* 549; *De Planche,* 60).

12. B. baptica, *nob.*—Symplocos baptica, *Brongn. & Gris, l. c.* p. 249.—Chasseloupia tinctoria, *Vieill. l. c.* p. 248. *V. s. in herb. citato,* montibus de Balade (*Vieill.* n. 547, 548; var. β, *Vieill.* n. 546).

13. B. lucida, *nob.*—Symplocos lucida, *Brongn. & Gris, l. c.* p. 249.—Chasseloupia lucida, *in parte, Vieill. l. c.* p. 430. *V. s. in herb. citato,* Wagap (*Vieill.* n. 559).

14. B. nitida, *nob.*—Symplocos nitida, *Brongn. & Gris, l. c.* p. 249. *V. s. in herb. citato,* Wagap (*Vieill.* n. 550).

15. B. montana, *nob.*—Symplocos montana, *Brongn. & Gris, l. c.* p. 250.—Chasseloupia montana, *Vieill. l. c.* p. 430.—C. microphylla, *Vieill. l. c.* p. 430: *v. s. in herb. citato,* montibus de Balade (*Vieill.* n. 551); Nebo (*Deplanche* n. 32).

16. B. gracilis, *nob.*—Symplocos gracilis, *Brongn. & Gris, l. c.* p. 250.—Chasseloupia gracilis, *Vieill. l. c.* p. 431. *V. s. in*

herb. citato, montib. de Balade (*Vieill.* n. 544–282); Puebo (*Deplanche* n. 56).

§ 3. *Species Japonicæ.*

17. Bobua japonica, *nob.*—Symplocos japonica, *A. DC. Prod.* viii. p. 255; *Paxton & Lindl. Fl. Gard.* p. 61, tab. 32; *Walp. Ann.* iii. p. 919.—Symplocos lucida, *Sieber & Zuccar.* (*non Brongn. & Gr., nec A. DC.*), *Flor. Japon.* p. 56, tab. 24. In Japonia: *non vidi.*

18. B. prunifolia, *nob.*—Symplocos prunifolia, *Sieb. & Zuccar. Abhand. Akad. Wissensch.* iv. 3, p. 133; *Walp. Ann.* i. p. 498. In Japonia: *non vidi.*

19. B. myrtacea, *nob.*—Symplocos myrtacea, *Sieb. & Zuccar. Abhand. Akad. Wissensch.* iv. 3, p. 133; *Walp. Ann.* i. p. 498. In Japonia: *non vidi.*

20. B. lancifolia, *Sieb. & Zuccar. Abhand. Akad. Wissensch.* iv. 3, p. 133; *Walp. Ann.* i. p. 499. In Japonia: *non vidi.*

21. B. leptostachya, *nob.*—Symplocos leptostachya, *Sieb. & Zucc. Abhandl. Akad. Wissensch.* iv. 3, p. 134; *Walp. Ann.* i. p. 499. In Japonia: *non vidi.*

22. B. neriifolia, *nob.*—Symplocos neriifolia, *Sieb. & Zucc. l. c.*; *Walp. Ann.* i. p. 499. In Japonia: *non vidi.*

23. B. theophrastæfolia, *Sieb. & Zucc. l. c.*; *Walp. Ann.* i. p. 499. In Japonia: *non vidi.*

On Branch Tubers and Tendrils of *Vitis gongylodes*. By R. Irwin Lynch, of Kew Gardens. (Communicated by Dr. J. Murie, F.L.S.)

[Read November 21, 1878.]

(Plate XV.)

I have the pleasure of calling the attention of the Fellows of the Society to living specimens of *Vitis gongylodes*, illustrating its peculiar habit of forming a tuber at the extremity of every branch when ceasing growth for the season. They are analogous to the subterranean tubers produced by the potato and many other plants; but, in contrast to the tubers of an ordinary kind, they are produced in the air at considerable height, and, when the branches

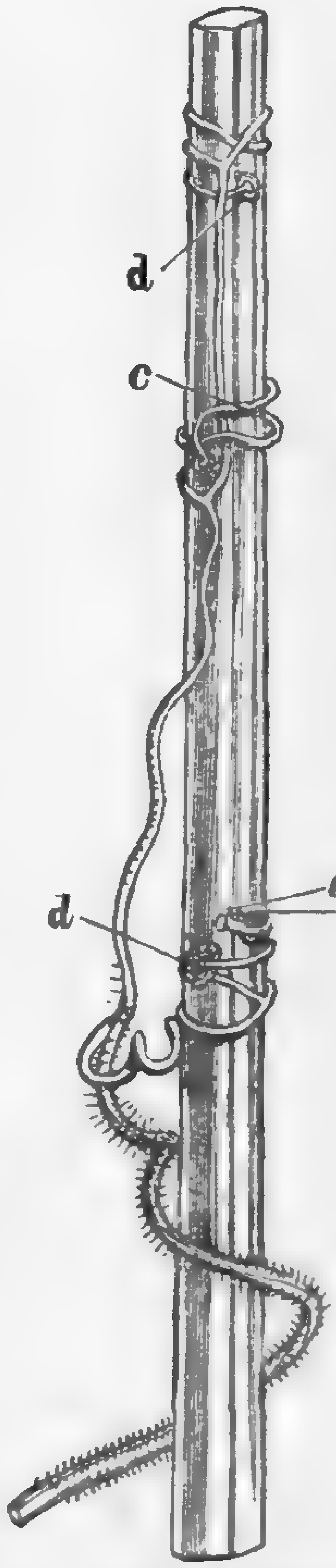
decay or become weak, fall to the ground and grow. Their special purpose would seem, at first, to be the preservation of life through a long season of drought. It would be fair to assume this, because after nearly twelve months' keeping in a dry place, I have found them still plump, full of life, and ready to grow when placed under circumstances of warmth and moisture. They would survive under conditions necessarily fatal to other parts of the plant. Their capacity for retaining life does not necessitate the conclusion that this must be their special function; and I am led to say this, because so far the plant is only recorded from a perpetually wet country. They appear to answer as a means of propagation, just as do the bulbils of a Lily—which fall off and grow, without being able to withstand drought better than the bulbs beneath the soil.

Axillary and other bodies that fall off and grow are not uncommon. Tiny tubers are produced in the leaf-axils of some species of *Begonia*; and curious round tubers are formed by some species of *Dioscorea*; bulbils are frequent among bulbous plants; and asexual means of propagation, known by the same term, obtain in *Chara*, thallus of Hepaticæ, and frond of many ferns, &c.; while the leaves of many species have little plantlets ready to grow on falling to the ground, or which soon develop when the leaves are in contact with moist soil. All these cases differ from the one before us, none having the same origin. The tubers of *V. gongylodes* are formed by the special development of an already existing stem; and on this depends the interest of the case. The branches of many plants would grow on accidentally falling to the ground; but these tubers are endowed with special vitality, and so prepared for intentional separation. I am unable to find by inquiry at the Kew Herbarium that any case of similar kind is on record. It is not described in the 'Flora Brasiliensis,' where I believed there would be all the information of this plant in a wild state. No mention is made in the manuscript notes of Burchell, who collected the only specimens in the Kew Herbarium near Para.

Little requires to be said about the development of these tubers. The onward growth is arrested; and the stem commences to swell from about the last unfolded leaf backwards either one or two nodes. Tubers of two swollen internodes are very common; and sometimes the swelling tapers off in some part of the second internode from the point. The form is usually oblong, or tapering from an obtuse apex to the base, with a constriction at the node

when the whole is composed of two internodes. The formation of the tuber never takes place up to the growing point; there is always a short portion of stem which falls away, with also one or two leaves of stunted development.

The tendrils of this vine are of great interest, on account of their having adhesive disks already formed without the stimulus of contact with any substance, two such plants only being recorded by Mr. Darwin in his highly interesting work 'Climbing Plants.' One of these at least, *Vitis* or *Ampelopsis Veitchi* (*V. tricuspidata*), is entirely dependent on its disks for climbing-support, while this species can, and does sometimes, entirely dispense with their aid. The adhesive disks are so rarely formed by the tendrils of climbing plants, that Mr. Darwin has observed only four species and referred to two others. We read of *Bignonia capreolata* (*l. c.* p. 102), "If the hooked extremities of the tendrils do not touch any thing, disks, so far as I have seen, are never formed; but temporary contact during a moderate time suffices to cause their development." Then, in a footnote, that Fritz Müller states that in South Brazil the trifid tendrils of *Hoplolophium* (one of the Bignoniaceæ), without having come into contact with any substance, terminate in smooth shining disks; and that these, after adhering to any object, become considerably enlarged. With regard to *Ampelopsis hederacea*, the Virginian Creeper, Mr. Darwin says that the "disks are never developed, so far as I have seen, without the stimulus of at least temporary contact with some object;" adding, in a footnote, that Dr. M'Nab remarks ('Trans. Bot. Soc. Edinburgh,' vol. xi. p. 292) that the tendrils of *Ampelopsis Veitchi* bear small globular disks before they have come into contact with any object; and that he has since observed the same fact. At p. 179 we read that "The rapid development of these adherent disks is one of the most remarkable peculiarities



Tendril of *Vitis gongylodes*.

On piece of Bamboo, showing at *d*, *d* the enlargement and attachment of disks, at *c*, *c* cellular adhesive layers, and at *e* a disk unenlarged. From young specimen growing at Kew.

possessed by any tendrils. We have seen that such disks are formed by two species of *Bignonia*, by *Ampelopsis*, and, according to Naudin, by the Cucurbitaceous genus *Peponopsis adhærens*." By this we observe that they are curiously found in widely distinct natural orders, and are not by any means a generic peculiarity.

I notice in the plant before us (*V. gongylodes*) that, although the disks are able, as I have seen, to attach themselves to a nearly smooth surface, yet they still prefer a crevice in which to insert themselves; and the tendrils possess an extensive power of search to find one. I have seen the case of a tendril with three branches, each with its disk in the same crevice, where of course they have the advantage of wedging themselves by an accession of cellular tissue. The tendrils also delight to twine, or clasp, and do not then always further develop their adhesive disks; sometimes they do, however, and then, as it were, clench their attachment. These tendrils having a well-developed revolving movement, it is interesting to note that such is not always the case with the disk-bearing tendrils of other plants. It does not happen with *Ampelopsis hederacea*, and probably not with *A. Veitchi*, but again occurs in *Bignonia capreolata*. The adhesive disks of *Vitis gongylodes* apparently enlarge when most necessary: in one case the arms of a tendril had about half-encircled a thick round bar; and this being an insufficient support, the disks grew to a large size, so that a firm hold was obtained. The disks sometimes enlarge without forming an attachment to an object; but this perhaps happens from previous irritation, as supposed in the case of *Ampelopsis hederacea* by Mr. Darwin. In one case two tendrils had met each other through an opening in ornamental ironwork; and in this position they became entwined together, and thus formed a strong support to the branch, just as one might clasp the hands over a bar and so cling to it. This I mention, bearing in mind that when the tendrils of *Bignonia dioica* become entwined with each other, they again release themselves. The power of clasping or entwining a support is perfect; a bar 1½ inch broad I have seen well embraced. And in addition to this and the development of adhesive disks, there is frequently a growth of whitish adhesive tissue along the course of the entwining branch at points of contact, just as occurs in the case of *Hanburya mexicana*, of which Mr. Darwin says that, "after a tendril has once firmly coiled itself round a stick, it is difficult to imagine of what use the adhesive cellular layer can be," a remark which applies to this and

to the enlargement of the disks when it also happens. These tendrils possess a threefold power of attachment—by entwining, by the adhesion of disks, and of the cellular layer. This, I believe, is not described of any other plant.

The specimen from which these tubers and tendrils have been taken is of singular and striking interest in the Victoria house at Kew; and especially is this so during summer. The ternate leaves are of elegant outline, shining on the upper surface; and the square stems are adorned on each angle by a broad wavy and ciliated wing. These beautiful features, however, might easily pass unnoticed from the height at which the stems grow; but no observer, however casual his examination, can fail to notice the large number of stout roots, which, springing from each node, grow down to the water, and as it were form a curtain along the course of the stems above. In summer, when growing, these roots are of beautiful crimson colour. The cluster of four roots exhibited grew from a single node; they are more than 11½ feet in length, and no doubt would have been much longer had they been able or required to grow further.

DESCRIPTION OF PLATE XV.

Vitis gongylodes. 1. The extremity of a branch, showing the early condition of a tuber, to which the leaves are still attached. 2. A mature tuber that grew after twelve months' keeping. 3. Slightly enlarged portion of a tendril, showing a disk as always present, without stimulus of contact.

Note on *Gardenia turgida*, Roxb.

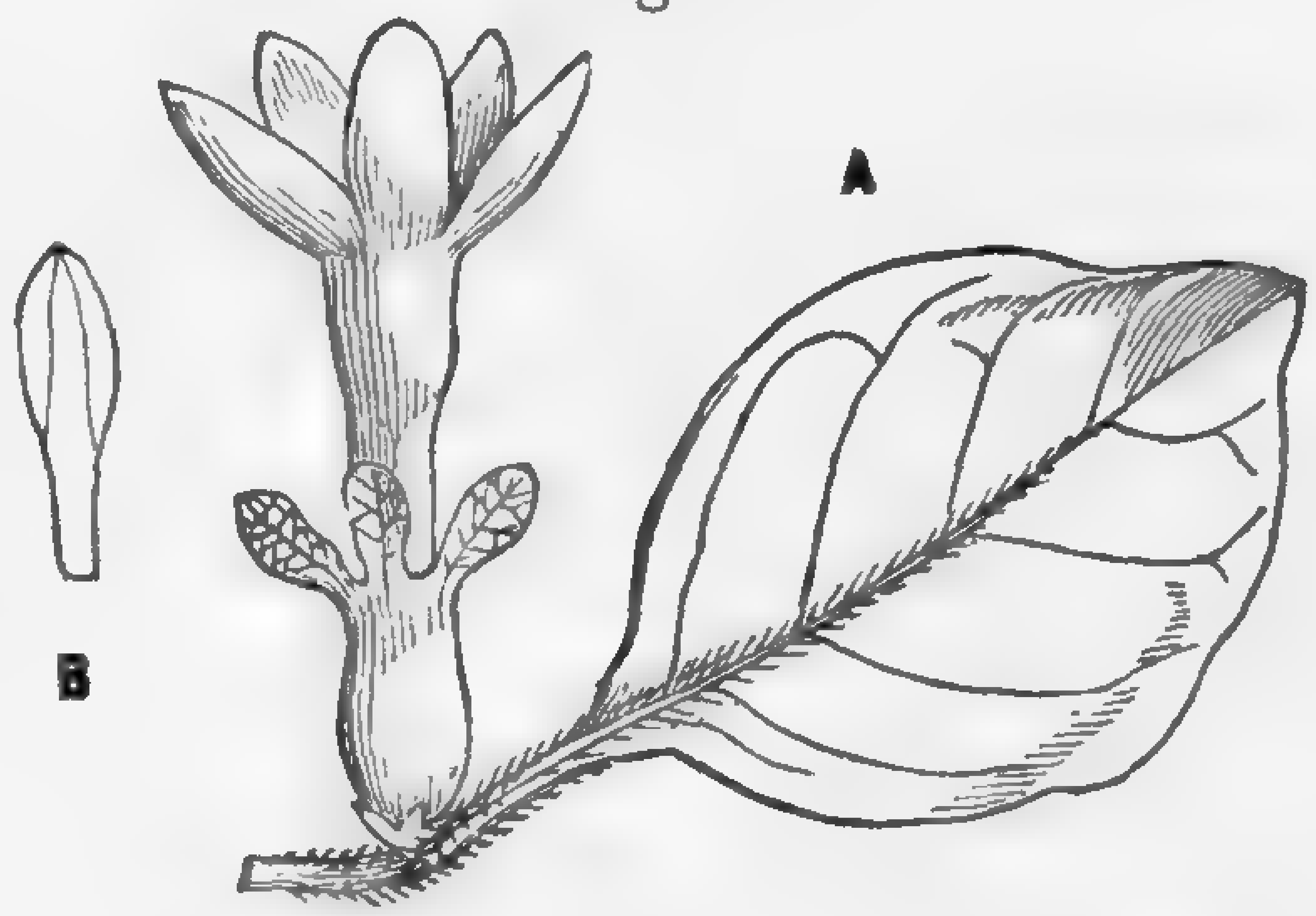
By C. B. Clarke, M.A., F.L.S.

[Read December 5, 1878.]

The genus *Gardenia* contains several Indian species with large sweet-scented flowers, which are included by Sir J. D. Hooker in his subgenus *Eu-Gardenia.* These have (so far as is known) hermaphrodite flowers; the calyx-limb is usually produced above the ovary and funnel-shaped; and the nearly allied Indian species are distinguished mainly by the calyx-teeth, which are lanceolate, ¼–½ in. long in *G. lucida* and *G. latifolia*, but 0 in *G. tubifera* and *G. speciosa.* In the parallel genus *Randia* the calyx-teeth are in like manner in some species minute, in others ½–1 in. long.

The next subgenus of *Gardenia* in Benth. & Hk. f. Gen. Pl. ii. 90, is *Ceriscoides*, of which the type is given by three species founded by Roxburgh (Fl. Ind. i. 709–711), viz. *G. campanulata*, *turgida*, and *montana* (figured by Wight, Icon. tt. 577, 578, 579). In this subgenus all the branches preserved at Kew are dioicous, some carrying clustered pedicelled male flowers, others solitary sessile fruits; a few branches exhibit solitary sessile female flowers. The flowers and fruits greatly resemble those of the subgenus *Eu-Gardenia*, but are much smaller. These three species of *Ceriscoides* are very close together: *G. turgida* has the corolla-tube cylindric, $\frac{1}{2}$–$\frac{3}{4}$ in. long; *G. campanulata* has the corolla-tube campanulate, $\frac{1}{4}$ in. long; *G. montana* hardly differs from *G. turgida*, except by having the leaves hairy beneath.

Fig. 1.



A. Female flower, solitary, sessile. B. Style.

Male and female branches of *G. turgida* have been communicated from the Calcutta Botanic Garden, and seem (from the

Fig. 2.

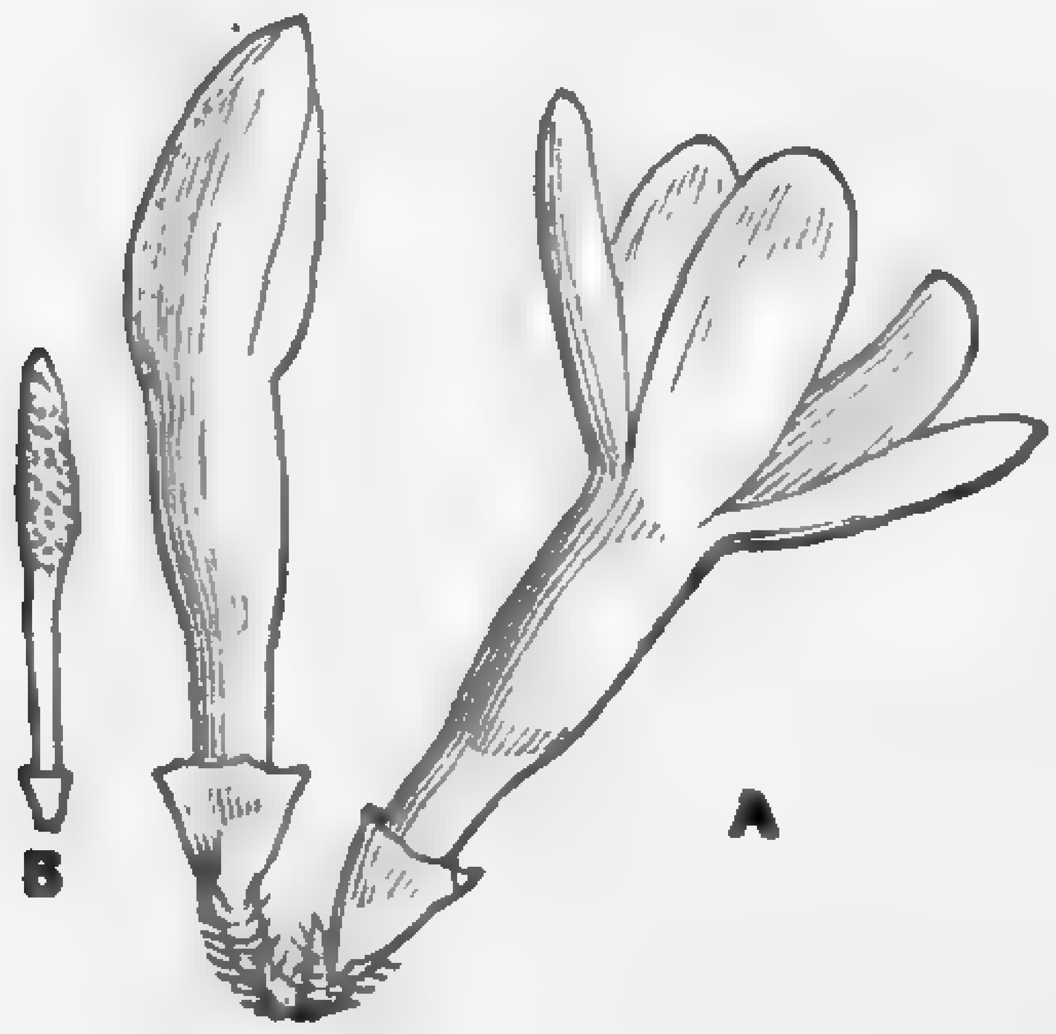


Fig. 3.

Fig. 2. A. Male flowers, clustered, pedicelled. B. Style and ovary from the same; stigma covered with adhering pollen-grains; ovary quite aborted.

Fig. 3. Male flower (from a male plant) having one enlarged calyx-segment.

peculiar bark) as though cut from one shrub; but it has been doubted at Kew whether they belong to one genus; for the calyx-teeth in the male flowers are 0, in the females oblong, $\frac{1}{4}$ in. Roxburgh describes the calyx as "slightly 5-toothed" in *G. turgida*, "somewhat 5-toothed" in *G. montana*. Wight's Ic. t. 578 (*G.*

campanulata) represents a branch with clustered male flowers, and shows the calyx slightly 5-toothed. Wight's Ic. t. 579 (*G. turgida*) represents the flowers, some clustered, some solitary, the calyx-teeth small, triangular, acute; the figure appears a compromise between male and female specimens. Wight's Ic. t. 577 (*G. montana*) represents a branch with clustered male flowers above, ripe solitary fruits below, the calyx of the male flowers scarcely toothed. It is possible that *G. montana* may be monoicous; but it is hardly probable that one branch carries male flowers and ripe fruit at the same time; the picture, I fear, is a composition. Neither Roxburgh nor Wight appears to have had the slightest suspicion that the flowers were strictly monosexual, far less that they might be dioicous. Roxburgh, however, complains of his specimen plant of *G. turgida*, that after being twelve years in the Calcutta Botanic Garden it had never ripened a single fruit.

Next Blume (Bijd. 1017) finds *G. campanulata*, Roxb., in Java. Blume's work is a very remarkable one; and he is not often far wrong in his identification of Indian plants. De Candolle, however (Prodr. iv. 383), makes a new species, *G. Blumeana*, DC., out of Blume's plant, because Blume described it as with calyx-teeth "ovatis obtusiusculis."

The explanation I offer of these difficulties is:—*G. turgida* is a dioicous shrub, or at all events the branches are very generally monosexual; the male flowers have the calyx-limb truncate, with 5 minute points on the margin (fig. 2); the calyx-limb of the female has 5 spathulate elliptic lobes $\frac{1}{4}$ in. long (fig. 1). In one male branch I have found *one* male flower in which the calyx has one enlarged calyx-tooth (fig. 3). *G. campanulata* and *montana* have similarly a truncate calyx in the male, a lobed calyx in the female flowers. If some reason be required for so curious an arrangement, we may suppose that the female flower benefits by an extra protection in a greater degree than does the male. The third figure is the only male flower with an enlarged calyx-segment that I have been able to find.

Note on South-African Orchids. By W. MANSELL WEALE. (Communicated by Sir J. LUBBOCK, Bart., M.P., and abridged.)

[Read December 19, 1878.]

ACCORDING to the observations of Mr. Weale made on living plants in South Africa, he finds that structurally *Mystacidium* and *Polystachya* do not agree in those generic characters pointed out as characteristic of them by botanists. Thus *Mystacidium* in the fresh state and with the parts *in situ* shows that the so-called two-legged caudicles are essentially free and not adherent. By slight manipulation with a horse-hair or fine pin, the two pollinia are seen twisted round and widely separated—a position unattainable had the caudicles been united as represented in Harvey's 'Thesaurus Capensis,' and moreover under the circumstances the pollen never would have fertilized the plant. In the case of *Polystachya*, of the four pollen masses said to be grouped in pairs, the fresh plant shows that each waxy pollen mass is partially cleft, *not* divided, and is attached by a very short caudicle to an ovate viscid disk common to the two pollinia.

On the Absorption of Rain and Dew by the Green Parts of Plants*. By the Rev. GEORGE HENSLOW, M.A., F.L.S., F.G.S.

[Read November 7, 1878.]

1. *Introduction.*

THE subject of this paper has been a matter of controversy for 150 years; but it is hoped that at last the question whether moisture of any kind is absorbed or not by the aerial parts of plants will be set at rest for ever, and answered in the affirmative.

The many and varied experiments I have made, extending over some years, have convinced me that such is the case; and they corroborate entirely the conclusions of M. Boussingault and other modern physiologists. M. Boussingault's researches have proceeded simultaneously with my own, but quite unknown to me, until they appeared in the 'Annales de Chimie et de Physique'

* This paper as originally written embodied an historical *résumé* of experiments and views on the subject, extending over the last 150 years. I had also added a good many more of my own experiments than are now recorded in the text. As, however, the conclusions had been to some extent anticipated by M. Boussingault and others, agreeably to the recommendations of the Council, I have omitted nearly the whole of the historical part and recast the experimental, retaining a few only of each series of my experiments.

(Mars 1878); and while our conclusions are identical, our respective experiments really supplement each other; so that although his results have now been published, it is thought advisable to publish a selection of mine also as corroborating those of M. Boussingault.

Hales, in 1731, and Bonnet, in 1753, alike *inferred*, but did not actually *prove*, that plants absorbed rain and dew.

De Candolle, Meyen, and Treviranus and others, however, objected to Bonnet's conclusions, asserting positively, but apparently without experimental evidence in support, that the leaves which he laid on the surface of water kept fresh for lengthened periods solely because transpiration was assumed to be arrested. Had they fixed watch-glasses on the surfaces of the leaves, as I have done, transpiration would have been easily detected.

Notwithstanding these objectors, a general belief seems to have been held until 1857, when M. Duchartre performed his experiments; and although he had himself been previously of the opinion that if plants could not absorb vapour (which Boussingault has now proved to be the càse) they could at least imbibe dew and rain, yet he was led to abandon this view; and he is responsible for the opposite one being generally held till now by vegetable physiologists. It should be observed that practical horticulturists have never abandoned the idea that plants can and do absorb water by their leaves.

As this change of view has been somewhat of an obstruction to the progress of vegetable physiology, and, as far as I am aware, no serious attempt has been made to refute M. Duchartre's conclusions, I do not think it out of place to try and expose their fallacy.

He commences* his paper by objecting strongly to experimenters using cut leaves or shoots instead of growing plants in their entirety; but he gives no grounds for raising this objection. On the other hand, it is easy to prove that all the functions of a leaf *are* carried on when detached as when growing: transpiration can be readily detected; and M. Garreau found in his experiments on respiration that "detached leaves gave the same results as those which remained attached to the plant" †; and if a green shoot

* "Recherches sur les rapports des plantes avec la Rosée," Bull. de la Soc. Bot. de France, t. iv. p. 940; "Recherches expérimentales sur les rapports des plantes avec la rosée et les brouillards," Ann. des Sc. Nat. 4me sér. xv. p. 109.

† "De la respiration chez les plantes," Ann. des Sc. 3me sér. xv. p. 12 (1851).

be plunged into water the evolution of oxygen can readily be seen. Moreover M. Duchartre compares a shoot to a detached limb of an animal, to which it is obviously not comparable; for there is no such mutual dependance between a shoot or a leaf and the main stem as in the case of an animal's limb. The one can be detached and made to strike root and grow into an independent plant; not so the other.

All that can be called injurious to a shoot when detached for experimental purposes lasting for a short time only, is that the supply of water is cut off. The shoot may become flaccid and slightly enfeebled; but in no sense are its functions impaired. And I maintain, making due allowance for that fact, whatever results a cut shoot or detached leaf gives in the matter of absorption and transpiration, they *are* legitimately applicable to a growing plant. Those who assert it to be otherwise must bear the burden of the proof.

M. Duchartre's experiments were made with plants growing in pots, the latter being carefully protected from imbibing any moisture by a mechanical contrivance. The plants thus prepared were weighed at 6 or 6.30 P.M., then subjected all night to dew. They were again weighed at 6 or 6.30 A.M. on the following morning, with the dew still upon them. The leaves were then carefully wiped one by one till the whole plant was dry. It was then again weighed; and the result was that the weight was almost exactly the same or more generally a little less than it was the evening before. Duchartre consequently came to the conclusion that in our climates dew is *not* absorbed directly by plants, but that it contributes to their nutrition indirectly only, (1) by reducing the nocturnal transpiration to nothing, and (2) by the intervention of the soil, which absorbs the dew.

The fundamental objection that I raise against his conclusion is that he has not considered the difference that exists between the statical or nearly statical conditions of the internal flow of water in a plant at night, with the dynamical or active flow ever taking place as soon as transpiration and evaporation are perfectly resumed in sunlight and heat.

He has shown it to be true, though not so absolutely as has been often asserted, that transpiration is greatly checked when the surfaces of the transpiring organs are thoroughly wetted, or when in darkness. Darkness and superficial moisture combined, as on a dewy night, must therefore reduce this vital act to a

minimum. The internal flow upwards from the root, however, is not at the same time equally checked; for the temperature of the soil is not lowered to the same extent as that of the air.

Hence every thing tends to bring the juices to as high a point of saturation at night as possible. Under these conditions one would hardly expect dew to be imbibed in any appreciable quantity, *unless the leaves and herbaceous stems were exceptionally flaccid.*

Now Duchartre always weighed his plants early in the morning after this statical condition was fully attained; so that it is not at all surprising to find that he could not detect any increase of weight; hence his experiments seem to prove conclusively that *at night* dew is not usually absorbed in any appreciable degree.

Dew, however, does not disappear suddenly from leaves at sunrise; and it is only after sunlight and heat begin again to affect leaves that the other function of dew is now carried on, its actual absorption. Herein, however, is involved a practical difficulty; for the balance will no longer help us. But I believe that as soon as transpiration recommences, then any part that may be the first to become dry will now begin to transpire, and so cause an indraught of dew in any neighbouring spot where it may have been retained; so that there will be an influx and efflux accompanied by the usual root-supply, which probably furnishes the main source of water for transpiration. Hence it will be seen that it is generally impossible to detect the absorption of dew or rain by leaves with mathematical accuracy or to prove it to demonstration. On the other hand, the "proof" that such is the case may be arrived at indirectly by accumulating probabilities, based upon observed facts. Such is the method I have attempted by aid of the following experiments.

The conclusion I have arrived at is that, while there is no objection that I know of which cannot be met, there are ample reasons for believing that dew and rain are, under certain circumstances, absorbed and utilized to supplement the normal root-supply.

2. *Experiments illustrating the Power of Absorption of Water by the Epidermis of Herbaceous Internodes.*

A shoot of first year's growth of Elm had three internodes wrapped up in saturated blotting-paper on June 12, 1876. By the 15th the leaves were flaccid and nearly faded; but the terminal

bud and a leaf adjacent to it remained quite fresh. By the 20th all four leaves were almost dead, with the exception of the bases of the blades. The terminal bud remained perfectly fresh until the 29th, when the whole was dead. Duration 17 days. A similar specimen not moistened totally perished in 2 days.

When herbaceous plants, especially those with tolerably large leaves, as *Borago officinalis, Rumex crispus, Sisymbrium Alliaria, Lychnis dioica*, &c., have only their internodes wrapped up in saturated blotting-paper, the leaves generally soon wither and perish, but the internodes remain green and fresh for long periods.

A branch of Borage having two internodes was wrapped up on June 8th, 1876. On the next day the leaves were much faded, but the stem was quite firm. On the 10th the upper part of the leaves was brown, brittle, and dead, but no change had taken place in the stem. By the 12th the leaves were entirely withered, excepting a small portion at their bases. On the 13th the leaves were quite dead. The internodes remained firm, green, and fresh. They thus continued until July 10th. They then decayed slowly. Duration 5 weeks and 3 days.

A similar specimen not wrapped up was perfectly dead in 2 days, the previously juicy stem being now dry and collapsed.

The long time during which the leaves remained green, of the first described of these specimens of Borage, clearly proves that the supply of water must have been obtained through the epidermis of the internodes to balance the transpiration.

Symphoricarpus, or Snowberry.—A shoot had one internode wrapped up, with four leaves *beyond* it exposed. After 3 days the lower pair of leaves were dying, but the upper pair were fresh. After 8 days all the leaves were dead; but the internode remained fresh several days longer.

A second and similar specimen had also four leaves exposed; but they were *below* the internode which was wrapped up. The order of decay was in this case reversed; the two lowermost or furthest from the wet internode died first, those nearest to it last.

The above are selected from a large number of experiments to illustrate the fact that herbaceous internodes readily absorb moisture in the endeavour to supply the leaves with water for transpiration, but that the demand is usually much greater than one or a few internodes can furnish: hence the leaves soon begin to die back from their apices to their bases. In addition to such supply as they can for a time give to the leaves, the experiments prove

that moisture applied to internodes arrests death and decay in the stems and axillary buds for variously prolonged periods; for efforts to develop axillary buds were frequently made, as well as adventitious roots, these being apparently special instruments for absorbing superficial moisture.

3. *On the Absorption by Leaves attached to Branches, and their Power of Nourishing the Rest of the Leaves on the Shoot.*

On July 23rd, 1878, a shoot of this year of *Corylus Avellana*, with a subherbaceous stem, had three leaves lying with their *lower* surfaces only on water. The shoot bore two large and two small leaves sustained in the air. The whole shoot was perfectly fresh and vigorous at the end of a week. On Aug. 3rd the larger leaves began to die back from their apices, while the terminal small ones were dead. Hence it was far from entirely perishing after 10 days.

A similar specimen had two large leaves with their *upper* surfaces only lying on water, the remaining leaves as before in air. Like the preceding, the whole kept perfectly fresh for the same time. The apical leaves began to die about Aug. 3rd, or after 10 days.

A similar specimen to these two, without water, was dead in two days, the leaves being brown and brittle.

Shoots of Lime, Elm, &c. treated as above gave similar results, showing that the presence or absence of stomata is immaterial, the upper surfaces of the above having none at all.

These experiments entirely corroborate the results of Hales, Bonnet, Baillon, Duchartre, Boussingault, &c., the general conclusion being that the duration of life in the specimen thus treated depends upon the supply being equal to the demand. The absorbing-power is incontrovertible; but the amount of foliage exposed varies the demand upon the power of imbibition.

To prove that the absorption and evaporation is not merely mechanical like a sponge, the following experiment will suffice. On the 10th of June, 1876, a cut specimen of *Nepeta Glechoma* had two leaves wrapped up in saturated blotting-paper. One internode was exposed, bearing two other leaves also exposed to the air. By the 16th the latter was much discoloured. On the 22nd they were nearly dead; but the buds in their axils had been developing, as well as smaller ones in the axils of the absorbing leaves. By the 27th both buds had borne four leaves each. One absorbing leaf was now dead. On July 10th the other absorbing leaf

perished; consequently the buds immediately died. Duration 4 weeks and 3 days.

4. *Experiments to show the Power of Absorption by Leaves and Internodes to nourish lower Leaves on the same Shoot.*

The possibility of an internode when wrapped up in saturated blotting-paper nourishing leaves below it has been shown in the case of *Symphoricarpus*. The following are instances in which the leaves alone or with the internodes did the same.

A frond of *Nephrodium Filix-Mas* had the terminal portion wrapped up on July 3rd, 1876. No sign of shrivelling occurred through that intensely hot month until Aug. 22nd, when a few pinnules began to turn brown. Leaving town, the specimen was neglected. Duration of observation 7 weeks.

The terminal leaflet of *Berberis aquifolia*, as those of *Dahlia*, *Polemonium*, *Wistaria*, &c., all nourished the basal leaflets well for various lengths of time.

Veronica Chamædrys, *Vinca major*, &c. all illustrated the same fact, that upper leaves can act as absorbents to supply lower ones on the same shoot, the lowermost leaves, *i. e.* those furthest from the absorbing ones, always dying first. *Vinca major* developed very vigorous axillary shoots from the axils of its absorbing leaves, similarly to the *Nepeta Glechoma* described above, the whole lasting 6 weeks.

5. *On the Nourishment of one Part of a Leaf by the Absorption of Water in another Part.*

The objection having been made by Duchartre that when leaves are laid upon water so that the edges are not touching it the absorption is merely *local*, and that water is not transmitted to the border, which consequently dries up, I have tried a large series of experiments, placing (1) the apex only, (2) the basal part, but not the cut end of the petiole, (3) the middle of the blade, plunging *both* surfaces beneath the water in every case. Again, I have taken the same parts, but placed (1) the upper side only, (2) the lower side only on water. The results gave every degree imaginable in the power of absorption. In some cases, e. g. *Ipomœa purpurea*, with the lower surface of the apical portion in water the part in air rapidly perished, as this leaf is particularly thin. In the majority of instances, however, it was at least two

days, generally many more, before the edges were dead; and in many cases they remained fresh for prolonged periods, even for weeks.

Nor is the result constant with the same kind of leaf. Some old Lilac-leaves had but feeble powers to nourish the parts in air when the apical parts only were laid on water; whereas leaves taken off the same shoot with the apical part completely immersed, or else with the middle part only in water, supplied the remaining parts sufficiently.

As a contrast to the leaf of the *Ipomœa* mentioned above, another leaf, placed with the upper surface of the apical half in water, nourished perfectly the basal part in air, as well as a long stalk.

Two leaves of Borage were laid, one with the under surface, the other with the upper surface of the apical parts in water; but they could only nourish the midrib of the part in air; the sides dried up as far as the rib.

Both the upper and and under surfaces of *Digitalis purpurea* nourished the parts in air perfectly.

In this and other corrugated leaves, the water runs into all the minute channels over the ribs and veins by capillary attraction and thus irrigates the entire surface. Garreau has noticed how, these channels, as well as the one very commonly occurring down petioles, are particularly advantageous for absorbing water.

The conclusion I have arrived at is that the objection raised is really of no consequence. In the majority of instances it is some days before the margins dry up where the central part only is wet. Moreover similar leaves not kept wet always perish far sooner altogether. This shows that even in leaves least capable of transmitting water laterally, they can do it to some extent; and if the leaves be thick, this is easily effected; and with corrugated surfaces the transmission is not only within, but without as well, so that the whole leaf becomes bathed with water, though the apex alone may be actually in it.

Now, when it is remembered that dew forms all over and on both sides of leaves, they are never in this artificial condition of being wetted only in part, at least at first; but as the dew dries up in one part of a leaf and transpiration has recommenced in sunlight, the above experiments thoroughly establish the right to believe that an influx will be set up to balance the renewed efflux caused by transpiration.

6. *On the Power of Absorption by detached Leaves laid on the Surface of Water.*

Of the preceding experiments, the results were solely judged of by the general appearance as presented to the eye. Such, however, clearly proved that leaves can readily act as absorbing organs in the absence of roots, not only to nourish themselves, but other leaves on the same shoot, especially if the stem be herbaceous.

In the following experiments the leaves were left as stated below from July 30th to August 3rd, 1878. They were all carefully weighed to the 5000th part of a gramme, then again at the latter date. The losses are reduced to percentages of the original weight of the specimens respectively.

Plant.	Proportional no. of stomata.	Surface on Water.	Loss per cent.	Apparent condition.
Berberis aquifolia......	0	Upper.	26·31	Fresh.
„ „	50	Lower.	13·38	Fresh.
„ „	In air.	......	49·10	Withered.
Ficus Carica	0	Upper.	1·52	Fresh.
„ „	100	Lower.	5·23	Fresh.
„ „	In air.	......	73·95	Dry and brittle.
Ligustrum vulgare......	0	Upper.	7·93	Fresh.
„ „	25	Lower.	1·73	Fresh.
„ „	In air.	......	53·33	Flaccid.
Prunus Laurocerasus...	0	Upper.	13·72	Fresh.
„ „ ...	20	Lower.	4·51	Fresh.
„ „ ...	In air.	......	21·39	Fresh.
Aucuba japonica	0	Upper.	5·97	Fresh.
„ „	50	Lower.	9·82	Fresh.
„ „	In air.	......	27·84	Slightly puckered.
Hedera Helix.....	0	Upper.	10·82	Fresh.
„ „	45	Lower.	16·64 (gain)	Fresh.
„ „	In air.	......	10·26	Fresh.

These specimens illustrate the fact that, unless the difference be very pronounced, the eye cannot judge of the amount of water a coriaceous, or even not always a herbaceous, leaf may have lost; secondly, that the loss is not entirely dependent upon, nor proportional to, the relative amount of stomata on the surface. In some cases, certainly the more often, there is less loss when the *lower* side is on the water; but even then this may not be referable to the stomata more than to a less cut icularized condition of the surface.

In the next series, in each case one specimen was partly plunged in water, the cut end (as in every experiment), as well as some leaves, were elevated in the air. They remained thus from July

30th to August 3rd. They were all weighed before and after the experiment, as before, in grammes to three places of decimals.

		Loss per cent.	Apparent condition.
Cedrus Deodara	Partly in water.	·09	Fresh.
" "	In air.	·57	Dry and deciduous.
Hedera Helix	2 leaves in water, 4 in air.	10·28	Fresh.
" "	In air.	10·26	Fresh.
Syringa vulgaris	4 leaves in water, 6 in air.	3·11	Fresh.
" "	In air.	67·20	Dead and crisp.
Thuja, sp.................	Partly in water.	6·19	Fresh.
"	In air.	21·97	Fresh.
Taxus baccata	Partly in water.	4·52	Fresh.
" "	In air.	23·92	Fresh.
Ilex aquifolia	Partly in water.	1·84	Fresh.
" "	In air.	13·33	Fresh.

These examples, taken from many others, show clearly that the leaves in air on the branches which have other leaves in water are easily and well nourished by the latter. In the case of Ivy but little difference is seen between the two percentages. This is due to the fact that, the transpiring surface of four leaves being greater than that of the absorbing, the supply was not equal to the demand.

The following specimens, weighed when gathered, were left without water for a day. They were then weighed again, their losses per cent. being given below. They were then partly immersed as before. They were once more weighed on the following day, after having been carefully dried.

Corylus Avellana,	first loss per cent.	49·60,	subsequent gain per cent.	57·20
Berberis aquifolia	" "	37·64	" "	13·42
Syringa vulgaris	" "	35·70	" "	18·80

In these three the foliage had faded to a considerable extent; consequently the gain per cent. is very large.

Hedera Helix,	first loss per cent.	10·76,	subsequent loss per cent.	7·30
Ilex aquifolia	" "	13·93	" "	9·04

In these two the transpiration exceeded the absorption; but the smaller loss after immersion, as compared with that before it, indicates that these coriaceous leaves had freely imbibed water.

Buxus sempervirens,	first loss per cent.	23·95,	gain per cent.	6·10
Aucuba japonica	" "	17·28	" "	4·58
Prunus Laurocerasus	" "	22·35	" "	12·12
Prunus lusitanica	" "	18·49	" "	·36
Thuja, sp.	" "	14·93	" "	6·84
Cedrus Deodara	" "	26·85	" "	45·57
Taxus baccata	" "	20·92	" "	25·46
Viburnum Tinus	" "	38·15	" "	44·21

In these specimens the gain varies according to the amount of foliage exposed to the air, and the consequent loss by transpiration, all tending to establish the general conclusion that the retention of freshness visible to the eye, or the variable amount of loss or gain as proved by the balance, depends solely upon the respective conditions of "supply and demand."

7. *On the Absorption of Dew.*

In the following experiments the leaves were gathered between 4 and 5 o'clock in the afternoon of September 10th, 1878. They were then exposed at an open window to the full light of the sun until it set. After two and a half hours the herbaceous ones showed obvious signs of loss of water, having become more or less flaccid. The loss was not *visible* in the case of the coriaceous leaves. They were all weighed at 7 P.M. A bright moonlight night followed, and an exceedingly heavy dew began to form at 7 P.M. The specimens were all spread out upon a grass-plot. At 7 A.M. on the 11th, before the sun was visible, in consequence of a very heavy mist, the specimens were carefully dried with a soft cloth so as to remove all trace of dew with which they had been entirely covered. They were then weighed. In every case there was an actual *gain*, as seen in the following Table. But besides the proof afforded by the balance, the stems and leaves had perfectly recovered the freshness and rigidity which they had lost on the previous evening.

	Gain per cent.		Gain per cent.
Tilia	16·40	*Viburnum*	6·84
Quercus	6·40	*Bryonia* (old leaf)	16·49
Sambucus (old leaf)	15·58	,, (young leaf)	10·31
,, (young leaf)	3·56	*Rubus*	14·28
Geranium	11·32	*Carduus*	10·71
Urtica	27·31	*Nepeta*	8·89
Mercurialis	14·50	*Malva*	9·09
Tussilago	31·56	*Ligustrum*	3·36
Grass	35·00	*Pulmonaria*	8·42
Hyacinthus	2·56	*Trifolium*	31·16
Rumex	16·66	*Syringa*	10·60
Senecio	8·44	*Taxus*	1·94
Fagus	24·05	*Berberis*	0·57
Philadelphus	8·33	*Aucuba* (young shoot)	2·20

8. *On the Absorption of "Imitation-Dew."*

Finding that I could imitate dew very exactly by means of the "spray," I adopted this plan, so as to apply what I call "imita-

tion-dew" to one, the upper or the under, surface of a leaf alone as required, or else to both surfaces at once, as it is in nature.

A large series of very various and freshly gathered leaves was experimented upon, the general result entirely corroborating previous conclusions. The loss per cent. was almost invariably *less* when the *lower* side only was covered with dew—which shows that absorption of dew by *that* surface is more readily effected than by the upper. Such, too, was the case, it will be remembered, with water.

The certain inference that we may draw is that dew (in nature) is absorbed from below to supply the transpiration from above.

Another series of some forty specimens consisted of leaves which were left three hours to become flaccid. They were then weighed; the loss per cent. from the original weight when freshly gathered was calculated. They were then treated with imitation-dew, there being three examples of each species; one had dew on the upper surface, another on the lower, the third on both sides. In more than half of them they *gained* weight after having been left to dry: the remainder had lost a very small fraction per cent. This was due to the fact that they had become quite dry some time before being reweighed; hence they had again begun to lose weight once more by transpiration.

Hence this experiment entirely corroborated the one mentioned above of the absorption of actual dew by slightly "wilted" leaves.

9. *On the Nourishment of Plants rooted in Pots by aid of their Leaves and green Internodes alone.*

A small healthy plant of *Mimulus moschatus* bearing three shoots was growing in a pot. I ceased to water it on June 4th, 1878. By the 8th the shoots showed signs of wilting; so I now placed the apices of two shoots only in water. On the 11th the leaves on the third and exposed shoot had all withered; but the small buds in the axils of the lowest pair of leaves but one remained vigorous, being about half an inch long. The smaller buds, a quarter of an inch long, were in the axils of the next pair of leaves. Lastly, the terminal bud and pair of leaves were quite fresh and green.

On the two stems which had their apices in water, the lowest leaves (in air) were more or less withered by July 2nd. The apex of the shoot in air and all its buds were now beginning to

grow vigorously. Three blossoms were borne and expanded on these shoots with their apices only in water.

By July 7th a great quantity of adventitious roots had made their appearance from the nodes in water.

This Musk-plant thus grew slowly, but well, for more than a month; and on removing it from the perfectly dry soil, several subterranean buds were pushing vigorously.

One learns also from this experiment, as from previous ones, that it is immaterial to a plant which way the water may flow; for it was *downwards* in the shoots with their apices in water, but of course upwards in the shoot in air.

A similar plant left without water on the same day (June 4th) became flaccid in two days, and perished utterly in two or three more.

Other plants, such as *Lysimachia Nummularia* &c., gave similar results.

10. *On the Advantages of Syringing Plants in a Green-house.*

This is, of course, a universal practice; but if the roots be the sole absorbing organs, as has been supposed, why do not gardeners confine the water to the roots? According to M. Duchartre, one would infer that nature only rains upon plants and deposits dew upon herbs solely because it cannot be helped, but with no direct benefit to vegetation. But it would seem that, by syringing, practical experience has forestalled the scientific rationale. Gardeners have all along believed in its efficacy, though they may not have "proved" the actual leaf-absorption. The physiological experiments of Hales, Bonnet, and others, down to those of Boussingault and myself will now, it is hoped, give a complete proof of this fact; and we may thus sum up the advantages of syringing:—It keeps the leaves clean from dust, and helps to wash off insects. It moistens the cuticle, and so renders it more pervious to carbon dioxide (*Barthélemy*). It also renders it more capable of absorbing water (*Garreau*). It checks the loss by transpiration (*Duchartre*), and so enables the terminal shoots and young leaves of a plant to be well supplied with sap by drawing upon the reserve fluid in the stem. It keeps the air cool by evaporation; and, lastly, it is actually imbibed by the leaves and green parts of plants, and so helps to compensate for any loss from within the plant, and thus supplements root-absorption.

What is true for syringing is, of course, equally true for rain.

11. *On the Preservation of Cut Flowers.*

Sachs, in his 'Text-book of Botany,' quotes the results obtained by Dr. Hugo de Vries on the withering of plants as follows*:—

"If rapidly growing shoots of large-leaved plants are cut off at their lower part which has become completely lignified, and are placed with the cut surface in water, they remain for some time perfectly fresh. But if they are cut through at the younger parts of the stem and are then placed in water, they soon begin to wither, and the more rapidly and completely the younger and less lignified the part where the section is made. This withering can be easily prevented by making the section under water, and taking care that the cut surface does not come into contact with the air, the conduction of the water through the stem then suffering no interruption. If care is taken that while the section is being made in the air the leaves and upper parts of the stem lose only a very small quantity of water by evaporation, withering does not begin till later, and increases only slowly after the cut surface is placed in water, and the leaves again transpire."

The cause of withering, Sachs then observes, is the interruption in the conduction of water from below. This agrees with Prillieux's observations†, that as soon as transpiration was checked in a faded shoot by placing it in a humid atmosphere, the water held in reserve in the stalk was drawn upon, and the shoot recovered. Similarly, Duchartre shows that withering results from one of two causes—either that the soil may not contain sufficient moisture to balance the loss by transpiration; or else the latter may proceed more rapidly than the water can be passed up the stem to keep pace with it, and so fail to retain the tissues in their normal state of turgescence.

Sachs and other observers, however, all allude to the cut end as *alone* being the place by which water is absorbed; and as its conductivity is rapidly impaired by exposure to air, it is recommended that a sufficiently long piece of the stem should be removed by a new cut above the first, but this time *beneath the surface of the water*. For a shoot about 8 inches long, 2 or 2½ inches should be cut off.

Now Bonnet's experiments and my own clearly show that absorption can take place through the surface of herbaceous stems and by leaves as well as the cut ends. This fact led me to presume that it would be judicious to retain one or more leaves upon a flower-stalk, as well as to allow the stalk itself to be of consider-

* P. 606, Eng. ed.

† "Expériences sur la fanaison des Plantes," Comptes Rendus, tome lxxi. p. 80, 1870.

able length, if the inflorescence was to be retained without withering as long as possible.

It was found, however, that if the flowers are well nigh at maturity, the additional impetus given to them by the extra absorbing surface hastened them too much, so that the petals would fall early; but, on the other hand, when the stem was ligneous, as of Lilac, or the inflorescence chiefly in buds, as of *Tradescantia* and Compositæ, then the advantage was apparent; so that instead of the buds perishing, they continued to expand successively.

A certain amount of judgment would therefore seem to be necessary in forming a bouquet, as to the desirability of retaining some leaves or not; but if the principle be understood that it is a question of "supply and demand," it will not be found difficult to discover to what extent it may be desirable to increase the absorbing surface in each case.

It is hardly needful to remark that the leaf must be in full vigour, and if it show any signs of decay, must be instantly removed. Moreover the leaves are apt, apparently through endosmotic action, to be after a time often coated with a kind of mucus, so that the water must be changed more often than when stalks only are inserted.

PS. Since this paper was read, a notice of it has appeared in a St.-Petersburg Journal*, *à propos* of making cuttings. M. G. Weidenberg believes that the reason of the frequent fading of cuttings before they have struck root is to be accounted for by the fact that, as a rule, the transpiration from the exposed leaves is greater than the amount of water which the cut end can supply. He recommends, therefore, that the cuttings should be longer than usual, and that some of the leaves should be buried as well, so that about one third of them may remain above ground. Those leaves in the soil will thus undertake the function of absorbing water. The ground (he adds) should be porous, to allow of free access of air, so that the roots may be formed rapidly before the leaves have time to decay. In this way Roses, Pinks, and other cuttings usually hard to strike, will make very good roots. (April 1879.)

* St. Petersburger Zeitung (Beiblatt), 20th Feb. 1879.

Note on the Genus *Oudneya*, Brown.

By Dr. HENRY TRIMEN, F.L.S.

[Read February 20, 1879.]

THE genus *Oudneya* was dedicated to the memory of Dr. Walter Oudney, R.N., by Robert Brown in 1826*. Dr. Oudney died, at the age of only 32, after long sufferings bravely endured under the hardships and difficulties of travel in an unknown country, on Jan. 12, 1824, at Murmur, in Central Tropical Africa. During his explorations in the two previous years he formed a herbarium of over 300 species, which was the subject of the well-known memoir by Brown, published as an appendix to the volume giving a narrative of the expedition.

Oudneya africana was founded on a few specimens of a small Cruciferous shrub of peculiar habit, growing in many of the wadis on the route between Tripoli and Mourzuk. Though constituting it a new genus, Brown did not consider it a new species, but identified it without any doubt with the plant described and figured by Viviani† in 1824 under the name of *Hesperis nitens*. The collection of plants worked up by this author was made in Northern Tripoli and Cyrenaica in 1817 by Della Cella: the figures are but rough outlines; and many of the species were scarcely determinable until M. Cosson, whose knowledge of the botany of North Africa is unequalled, carefully examined the types of Della Cella in Viviani's herbarium preserved at the University of Genoa, and published the results of his examination‡. He found that *Hesperis nitens* was a species of *Moricandia*, *M. suffruticosa*, Coss. & Dur., itself scarcely more than a variety of *M. arvensis*, DC.; consequently *Oudneya africana* was quoted by Cosson as a probable, though doubtful, synonym of that species§.

In 1855 the same eminent botanist (M. Cosson) published a new genus, *Henophyton*||, based on a plant found abundantly near Guerram, in the desert of Southern Algeria, which he named *H. deserti*, Coss. & Dur. This genus, which has good distinctive characters, was maintained in Bentham and Hooker's 'Genera Plantarum' in 1862¶, where the authors suggest that the scarcely

* Denham and Clapperton, Narrative of Travels, Appendix, p. 129.

† Floræ Libycæ Specimen, p. 38, tab. v. fig. 3.

‡ Bull. Soc. Bot. France, xii. (1865) p. 275. § *Loc. cit.* p. 280.

|| Bull. Soc. Bot. France, ii. (1855) pp. 246, 625. Dedicated to M. Hénon, who first found the plant in 1853.

¶ Benth. & Hook. f., Gen. Plant. i. p. 85.

known and imperfectly described *Oudneya*, R. Br., is probably to be referred to it; but they had been unable to see specimens.

In recently going through and selecting from Brown's vast Australian herbarium, in accordance with the will of the late J. J. Bennett, to whom it had been bequeathed, the herbarium of Dr. Oudney was discovered, having been accidentally laid away and overlooked. On an examination of the specimens of *Oudneya*, it was clear that they were not to be referred to *Moricandia*; and on M. Cosson kindly sending me examples of his *Henophyton deserti*, its identity with Brown's genus was at once evident. As Brown's name has the priority by 31 years, it must supersede Cosson's more recent one.

This determination is of some interest. It vindicates, were that necessary, Brown's judgment in proposing a new genus for the plant, though he wrongly referred to it a species already known by an imperfect figure and description; it corroborates the surmise of the authors of the 'Genera Plantarum;' and it secures the commemoration of one of the earlier victims of African exploration by fitly connecting his name with the only new genus in the collection which he made.

Note on the Fruiting of *Wistaria sinensis* in Europe. By W. T. Thiselton Dyer, M.A., B.Sc., F.L.S.

[Read March 6, 1879.]

In the paper by the Rev. George Henslow on the self-fertilization of plants, recently published in the Society's 'Transactions,' there occurs at p. 335 the following footnote:—

"Since this paper was read, one by Mr. Meehan has been printed in the Journal of the Linn. Soc., in which he shows how *Wistaria*, though it never sets seeds when 'trained,' yet, when grown as a 'tree,' does not expend its energy in forming long branches, and consequently fruits abundantly."

A statement of this kind, affecting so well-known a plant, is apt, when once put on record, to be copied from book to book unchallenged; and as I have considerable doubts both as to the accuracy of the fact and of the implied explanation, I venture to offer to the Society the result of some inquiries which I have made upon the subject for my own information.

And, first, as to the fruiting of the *Wistaria* when trained upon a wall or other support. While travelling in Switzerland during last autumn I spent some days at Glyon, at the eastern end of the Lake of Geneva. In the garden of one of the hotels there is a building, on the walls of which a remarkably fine plant of *Wistaria* is trained in the ordinary manner, with its branches spread out horizontally. When I saw it, this was so loaded with the brown tomentose pods as to present quite a singular appearance. I did not take any further notice of the circumstance at the time; but on seeing Mr. Henslow's statement, quoted above, that the trained *Wistaria* never sets seeds, the case of the Glyon plant immediately occurred to me. I wrote to the proprietor of the hotel to beg him to oblige me with some pods; and I got a reply in which he promised them, and informed me that they were produced in abundance every year. At the same time I took occasion to mention the matter to my friend M. Casimir DeCandolle at Geneva; and he wrote to me as follows:—

Geneva, Feb. 24, 1879.

"It occurs to me that the best way of answering your question concerning *Glycine sinensis* is by sending to you the two enclosed letters and specimens which I have received from my friends Barbey and Th. Plantamour, one of our best amateur horticulturists here.

"Barbey, whom I met again yesterday, added in conversation that M. Faviat, of Lausanne, told him that you were quite right in asserting that *Glycine* fruits on the walls of Glyon hotel.

"Such is not the case, however, with an old and vigorous plant which covers the wall of our country-house at Malagny, and which has never to my knowledge borne any fruit.

"From that negative observation, as well as from what both Barbey and Plantamour say on the subject, I am led to infer that the fruiting of *Glycine* trained on walls is much less frequent in the vicinity of Geneva than near the opposite extremity of the lake.

* * * *

"Yours sincerely,
C. DeCandolle."

It is not necessary to quote the letters which M. C. DeCandolle was so good as to transmit to me. It is sufficient to say that M. Plantamour states that at Sécheron, near Geneva, the

fruiting of the *Wistaria* is a rare occurrence, but that in 1874 his gardener raised a plant from one of two seeds in a pod produced by a *Glycine* trained on his orangery. It may, he says, have fruited at other times; but his attention had not been drawn to the fact. He also sent in his letter a pod gathered recently in a neighbour's garden from a trained plant.

M. Barbey states that the *Wistaria* fruits frequently at Lyons and in the Rhone valley from Villeneuve to Bex.

Wistaria sinensis, it may be remarked, is not adapted to a very rigorous climate. Mr. Hemsley states, "In the south of England it attains great perfection on a trellis or pillar; but in the north it requires the protection of a wall." * It is, as is well known, a native of China; and the Kew Museum possesses fine pods from Shanghae, the gift of the late Daniel Hanbury. Flowering, as it does, in May, before the appearance of the leaves, it appears to me probable that a temperature warmer than is sufficient for the production of flowers is necessary for the setting and early development of the fruit. The climate of the Rhone valley and the eastern end of the Lake of Geneva is well known to be milder than that of the western end. The mean spring temperature at Montreux and Villeneuve is higher than at Geneva; and to this circumstance I attribute the greater frequency with which the *Wistaria* fruits, as pointed out by M. C. De Candolle, proceeding towards the head of the lake. The same explanation applies to this country, where, however, the *Wistaria* has been known to fruit occasionally. Sir Joseph Hooker informs me that he has observed pods on an old plant trained against his house at Kew on more than one occasion.

It is a circumstance which is tolerably well known to horticulturists that flowers subjected to too cold a temperature *while still in the bud* may have their sexual organs so much injured that, though the flowers are still able to expand and reach their full development, they are nevertheless absolutely sterile. This is the case with the Pear and, I believe, the Apple, in which, as Dr. Hogg has demonstrated to me, the flowers examined superficially sometimes appear to have escaped all damage from frost, the petals, which might more particularly have been expected to show injury, being perfectly intact. And yet, on making a vertical section through the flower, the carpels (the most thoroughly protected in

* Handbook of Hardy Trees, Shrubs, and Herbaceous Plants, p. 124.

this case of all the flower-structures) are seen to be blackened and dead, while every thing else is apparently uninjured. I am not prepared to say that this is what happens in the case of *Wistaria*, though it is well known that its flowers are peculiarly apt to receive injury from spring frosts*; but I believe I am justified in concluding that the low night-temperatures of early spring are the probable cause of the sterility of our cultivated *Wistaria*, whether due to failure of fertilization or subsequent non-development of the fertilized ovaries.

There is the further question whether, as suggested by Mr. Meehan, the mode of growth in the cultivated *Wistaria* could have anything to do with its supposed uniform sterility. The view that it does so appears to me to rest on a mistaken application of a general principle—the antagonism of vegetative and reproductive activity. When a plant, from the mode of its cultivation, fails (as too often happens in our horticultural experience) to produce flowers, and develops in their place leafy shoots, we are justified in describing this as a diversion of the nutritive resources of the plant from sexual reproduction to vegetative growth. The generalization is, I believe, often carried too far, inasmuch as the reproductive function is characteristic of the adult stage of the organism; and it is for this reason that so many arboreal plants are barren when young, just as with animals, in whom the sexual characters are the crown and completion of the whole process of organic evolution.

But in the *Wistaria* I fail to see any evidence of such an antagonism, any more than in the Scarlet Runner. In fact, if it existed, it would not so much suppress fruit as suppress the flowers; and it is a matter of ordinary experience that in the *Wistaria* these are produced in remarkable profusion. But, in fact, there is nothing remarkable in the mode in which the *Wistaria* is ordinarily grown. It is a scandent shrub; and its attachment to a wall or trellis merely takes the place of the adventitious aids which it would obtain in a feral state. If the scandent habit (for this is all its trained condition amounts to) were the cause of its barrenness, it, and a host of other plants with a similar habit, must ages ago have become extinct.

* In 1872 the blooms in English gardens were killed by the frosts of March 23 and 24 (Journal of Horticulture, vol. xlvii. p. 442).

On some South-American Genera of uncertain Position, and on others not recognized by Botanists. By JOHN MIERS, F.R.S., F.L.S., &c., Dignitario et Commmendor Imp. Bras. Ordo Rosæ.

[Read February 20, 1879.]

AMONG the foremost of these genera is the *Pleraginea* of Arruda da Camara, mentioned in his Centenary of the plants of Pernambuco[1], of which he enumerated three species, all belonging to the *Chrysobalanaceæ*:—1. *Pleraginea rufa*, the plant of which is not described; but it produces a large drupaceous fruit, called "Oiticica coroia," sold in the markets, and at that time cultivated. This fruit is "irregular in shape, having a kernel covered with sweet fæcula, somewhat aromatic, pleasant, nutritive, and large enough to satisfy one person"—from which we may conclude that it is of considerable magnitude. It seems to approach the genus *Acioa* of Aublet. *Acioa guianensis*, described and figured by him, produces an ovate drupe $2\frac{3}{4}$ in. long, $2\frac{1}{8}$ in. in diameter, with a pericarp 6 lines thick, subcoriaceous, transversely fibrous, splitting all over the surface between the fibres into irregular chinks which reach the endocarp, from which these frustums do not separate; within this endocarp is a nut, oblong-ovate, 2 in. long, $1\frac{1}{8}$ in. broad, enclosing a seed covered by a reddish membranaceous integument, consisting of 2 large plano-convex fleshy cotyledons, which are edible, of a pleasant and agreeable flavour resembling that of fresh walnuts, and greatly esteemed by the natives. Here is some analogy between the seeds of *Acioa* and *Pleraginea*; but as Aublet makes no mention of the sweet arilliform coating over the cotyledons of *Acioa*, which is a prominent feature in *Pleraginea*, we may conclude that they form two distinct genera.

2. *Pleraginea odorata*: the plant is not described; it produces an oval or oblong drupe, very little smaller than a hen's egg, yellowish at the time of maturation. It is edible, the kernel being enveloped in a sweet aromatic nutritive pulp; this copious pulp, apparently arilliform, sufficiently distinguishes *Pleraginea* from *Acioa*, *Couepia*, and *Moquilea*.

[1] 'Koster's Travels in Brazil,' London, 1816, pp. 499–500. Also Dr. Arruda 'Dissertação sobre as plantas de Brazil,' Rio de Janeiro, 1810, in octavo, from which Koster's account seems to be a translation in part.

The third species, the *Pleraginea umbrosissima* of Arruda, is a tree growing in the desert Sertões of the province, upon the borders of rivers and rivulets, rising to the height of 50 or 60 feet; its branches are long and diffuse, being doubled downward so much that they nearly touch the ground[1]. The inflorescence is not known; but the fruits are abundant: the drupe is oblong, 2 in. long, ½ in. broad, retaining its greenish colour even when dry; the kernel is not very hard, being flexible and subligneous; it encloses within a layer of astringent matter an embryo consisting of two fleshy cotyledons, of a disagreeable taste, abounding in an oil which is usefully employed. These fruits are known by the name of Oiti or Oiticica. This description appears to me to correspond with the true *Couepia* of Aublet, as a reference to his figure will show[2]. It seems near the *Couepia Uiti*, Benth.[3], from Piouhy.

Couepia and *Acioa* were regarded by Aublet as very distinct from each other; and certainly the facts he exhibited are sufficiently differential to establish this truth. Notwithstanding this, the two genera have been united in favour of the former by Sir J. D. Hooker[3], without offering any reasons or any attempt to subvert the facts given by Aublet. The differences are many. In both genera the stamens are borne upon a unilateral cuneiform lamina, and seated upon its truncate margin; in *Acioa* there are only 12 stamens, while *Couepia* has always 30 or more. In *Acioa* the fruit is large, oval, with an extremely thick pericarp, which splits transversely and irregularly all over its surface, cracking down to the endocarp into unequal frustums, which do not separate from it: this endocarp is coriaceous and fragile; it encloses an oblong-ovate kernel covered with a thin membranaceous red integument, and consisting of two large fleshy cotyledons, which are edible and of a pleasant taste. In *Couepia* the drupe is not much smaller, is externally smooth and unbroken in its substance: the pericarp is thick and coriaceous, consisting of rather lax en-

[1] The trunk of this tree, abundant in the province, as well that of *Moquilea tomentosa*, Benth., is highly prized, as it affords the best timber for ship-building, both being there known under the designation of Viti or Oiticica (see Gardner's Travels, p. 137). The Paõ amarello mentioned in the same sentence as being also employed in ship-building, is abundant in some of the provinces, where it is called "Pequia amarello." It is the *Aspidospermum tomentosum*, Mart.

[2] Plant. Guian. i. p. 519, tab. 207.

[3] Flor. Bras. fasc. 42, p. 40.

tangled woody fibres, the endocarp being thin and brittle; the embryo has no extraneous coating, but is enclosed within the usual membranaceous integument, and consists of two large cotyledons which have an extremely bitter taste.

While treating of this family, I will mention that the *Parinarium* of Aublet is very different from the *Parinarium* of DeCandolle, of Bentham, of Hooker, and of Blume. In that of Aublet each pedicellated flower of the panicle has a cup-shaped calyx, with a border of 5 small teeth, and alternate with these teeth are 5 erect petals, and a little below their insertion 14 stamens without any appendage are affixed, 7 of which are unilateral and fertile, the other 7 anantherous stamens being consecutive, the filaments of all being free, erect, and capillary; the ovary, as long as the calycine tube, is somewhat gibbous, pilose, free, seated in the base, with a long exserted style and a bilobed stigma. In the *Parinarium* of Bentham the flowers have a very different structure. Two species from British Guiana are described[1]; and I do not hesitate to declare my firm conviction that both belong to *Licania*[2]; indeed, except in the specific character of the leaves, all the floral features nearly correspond word for word with those attributed to a Brazilian species of *Licania* by Dr. Hooker. This species was collected by me, in 1834, on the Corcovado, when I made a drawing; and I therefore know it well. The analysis of its flowers is well represented in Dr. Hooker's drawing: this shows 10 stamens not longer than the teeth of the calyx, all seated on the margin of an elevated membranaceous ring, 5 of them unilateral and fertile, the anthers oscillatory, the rest, without anthers, consecutive; the ovary, free in the base of the calyx, is pubescent, contains two ascending ovules: the drupe is concealed within the globular pubescent enlarged calyx, crowned by the five connivent lobes; it is 4 lines in diameter and is monospermous; though stated in the text to be unknown, it is, nevertheless, accurately figured in Dr. Hooker's plate before referred to.

Hence it follows that the *Parinarium* of Hooker must share the fate of that of Bentham, and the six species of Hooker should be transferred to *Licania*.

In regard to the fruit, Aublet shows that in *Parinarium mon-*

[1] *P. brachystachyum*, Benth., Hook. Journ. Bot. i. p. 213 (Schomb. 925), and *P. coriaceum*, Benth., loc. cit. p. 213 (Schomb. 65).

[2] *Licania Kunthiana*, Hook. in Flor. Bras. fasc. 42, p. 16, tab. 3, sub *Licania incana*, Benth. (non Aublet).

tanum[1] it is somewhat gibbous, 4 in. long, 3 in. broad one way, 2 in. broad in the cross direction, is externally smooth and yellowish, its outer envelope soft and of a subacid taste, 3 lines thick, and is partly pressed into the sinuosities of the nut. This large nut is osseous, with many crested irregular elevations, is 2-celled, solid, with an osseous dissepiment 2 lines thick; the cells 9 lines broad, each filled by an oblong seed covered by a reddish membranaceous integument, the kernel consisting of two large fleshy cotyledons, which are edible and of a sweet flavour. In the *Parinarium campestre*, Aublet[2], the fruit is much smaller, somewhat gibbously oval, 1¼ in. long, ¾ in. broad, having a smaller and somewhat pointed nut marked by irregular prominences. This is osseous, 2-celled, each cell containing one seed (the other sometimes abortive), with a reddish integument, the embryo white, with two large fleshy cotyledons, edible, and of a pleasant flavour. It has just been shown (*ante*, p. 335) that the smaller globose 1-celled fruit in the *Parinarium* of Bentham and of Hooker is widely and generically different.

Under *Parinarium*, Dr. Hooker likewise includes the several Malayan species enumerated by Blume. These are:—

1. *Parinarium scabrum*, Hasskarl[3], from Java.
2. *Parinarium glaberrimum*, Benth.[4], from Java.
3. *Parinarium Griffithianum*, Benth.[5] (*Exiteles multiflora*, Korthals), from Borneo.
4. *Parinarium Maranthes*, Blume[6] (*Exiteles corymbosa*, Blume), from Java.
5. *Parinarium sumatranum*, Blume[7], from Sumatra.

Blume considered that his *Parinarium sumatranum* is identical with the genus *Petrocarya* of Jack[8] (not of Schreber). In such case all the five above-named species of *Parinarium* must be transferred to the genus of *Petrocarya* of Jack. In Jack's plant the flower has 15 stamens, of which 8 are fertile and unilaterally placed along the margin of an elevated ring, the other 7 anantherous stamens being seated consecutively along the rest of the same

[1] Plant. Guian. i. p. 516, tab. 205.
[2] Plant. Guian. i. p. 518, tab. 206.
[3] Blume Mus. Bot. Lugd. ii. p. 96.
[4] Blume, *loc. cit.* p. 98.
[5] Benth. Niger Flora, in adnot. p. 334; Blume, *loc. cit.* p. 98.
[6] Blume, *loc. cit.* p. 99.
[7] Blume, *loc. cit.* p. 97.
[8] Calcutta Journ. Bot. iv. p. 165; Hook. Comp. Bot. Mag. i. p. 228; Walp. Ann. i. p. 271.

margin; the filaments of all are subulate. This structure is very different from that in the *Parinarium* of Aublet. Equally different is the structure of its fruit, which is a corticated nut adherent to the enlarged 5-toothed calyx, the size of a filbert, which it much resembles; it is gibbously oblong, 1-celled by abortion, the cell filled with a seed having copious albumen surrounding a cylindrical embryo, with a superior radicle longer than the two ligulate cotyledons.

The presence of albumen is not singular in the family: it occurs in *Chrysobalanus Icaco*[1], and in *Hirtella triandra*, Sw.[2]; but all mention of this circumstance is omitted in the generic diagnoses of the two genera in Dr. Hooker's monograph, and in the 'Genera Plantarum' of Bentham and Hooker; but I am able to confirm the presence of albumen in the seed of *Hirtella*, as Gaertner stated. I found it in the seed of *Hirtella hebeclada*, Moric. (*Hirtella Gardneri*, Benth.), from the Organ Mountains (Gardner 370, in my herb. 2228–2283, 3432–4094). Here the fruit, seated on the persistent calyx, is cuneately oblong, 9 lines long, 4 lines broad; it contains a seed with solid albumen 4 lines long, $1\frac{3}{4}$ line broad, enclosing in its lower part an embryo of 3 equal erect oval cotyledons, one anterior, two sublateral, with a minute inferior radicle. The presence of albumen in this genus is also confirmed by DeCandolle[3].

Returning from this digression, I will add that the *Parinarium senegalense*, Perr., and *Parinarium excelsum*, Sabine, from Sierra Leone[4], together with four undescribed species from Biafra, all appear to belong to *Griffonia*[5], a genus peculiar to tropical Africa, notable for its unilocular ovary with two ascending ovules, and a dry oblong 1-celled fruit, hispid within, containing a single erect seed with a membranaceous testa and a large exalbuminous embryo of two conferruminated cotyledons.

This latter most unusual circumstance will be referred to in my paper entitled "Notes on *Moquilea*," *posteà*, p. 371.

[1] Lam. Illustr. tab. 428 A; Schitzl. Icon. Ordo 274, ex Tussac. Antill. iv. tab. 31.

[2] Gaertn. fil. Fruct. p. 37, tab. 185, p. 40, tab. 185.

[3] Prodr. ii. p. 528.

[4] DC. Prodr. ii. p. 527.

[5] Benth. & Hook. Gen. Plant. i. p. 608.

Minguartia.

This genus of Aublet[1] is referred by Prof. DeCandolle[2] to the *Apocynaceæ*, tribe *Carisseæ*, near *Vahea* (*Urceolus*); but in my view it offers no approach whatever toward that family. At a casual glance it might be thought somewhat near *Ambellania*, nob. (*non* Aublet); but on examination this idea must be rejected, for in that genus the peltate seeds are inserted upon and partly imbedded in the thick fleshy dissepiment[3]. On the other hand, in *Minguartia* the seeds are far remote from either the dissepiment or from the walls of the pericarp, in a manner badly represented in Aublet's plate. It is clear, therefore, that *Minguartia* cannot belong to the *Apocynaceæ*.

We may gather from Aublet's description that the numerous compressed orbicular seeds in *Minguartia*, remote, as just stated, from within the dissepiment or endocarp, are arranged in the two cells in close proximity ("placées de champ les unes sous les autres") and imbedded in a pulpy substance which fills the cells—a development occurring in no other family than in the *Crescentiaceæ*. In *Crescentia*, in the young state, the ovary is unilocular, with several parietal nerves inside, along which many sessile ovules are affixed; the ovary grows into a fruit of large size; and in this growth, the placentæ, carrying with them the ovules, spread in all directions, becoming a fleshy pulp interspersed with numerous spiral nourishing-vessels, and is thus resolved into lamellæ, to which the seeds are severally attached at a central hilum. So in *Minguartia* a similar result may be traced. Although this mode of growth was not understood by Aublet, his details clearly manifest a similar structure and development.

In *Crescentia* the fruits are invariably unilocular, filled with soft pulp in which numerous seeds are imbedded in the manner above explained. In *Parmentiera*, as stated by De Candolle[4], the the fruits are 2-4-locular, especially in *P. edulis*, as well as in *P. aculeata* (*Crescentia*), H. B. K. In *Parmentiera cereifera*, Seem.[5], the wax-candle tree, the fruit is cylindrical, very long, 1 inch in diameter, with two opposite sulcate lines accompanied by two

[1] Pl. Guian. ii. Suppl. p. 4, tab. 370.
[2] Prodr. xvii. p. 295.
[3] Apocyn. S. Amer. p. 13, tab. 1 B.
[4] Prodr. ix. p. 244.
[5] Bot. 'Herald,' p. 182.

commissures, showing a disposition to form two valves, as figured by Seemann[1].

The dissepiment is not shown in his drawing of fig. 4, which was made from a hasty sketch of the living plant, the dissepiment being scarcely noticed by him. Here the parietal placenta, bearing the ovules, becomes expanded (as in *Crescentia*) into a soft waxy pulp in which the numerous small seeds are imbedded and are thus transferred into the middle of the cells.

From these parallel analogous facts it is manifest that *Minguartia* belongs to the *Crescentiaceæ*, forming a third genus of that family, distinct both from *Crescentia* and *Parmentiera*.

In *Minguartia guianensis*, a lofty tree, its many fruits are clustered in bunches, hanging down from the axils and extremities of the branches, as in *Parmentiera*: these fruits are pear-shaped, 4½ inches long, nearly 2 inches broad, on pedicels 1 inch long; they are smooth and greenish. The indehiscent pericarp, of soft fibrous consistence, is 3 lines thick, having a thin dissepiment; the many compressed seeds, imbedded in soft pulp in each cell, are orbicular, 4 lines in diameter, resembling those of *Crescentia cucurbitina*[2], and are peltately attached.

The conclusion formed, as above stated, from these concurrent testimonies, is that *Minguartia* belongs to the *Crescentiaceæ*; and this cannot, therefore, be denied.

Senapea.

It is not difficult to assign a proper place to this genus of Aublet, hitherto of doubtful position. *Senapea guianensis*[3] is a scandent shrub, with flexuose climbing branches, furnished with distant, alternate, elliptic, entire, petiolated leaves, acute at both extremities. The inflorescence is not known; but a single slender peduncle issues from the axil bearing a solitary large fruit, borne upon a small persistent calyx of five acute sepals. This fruit is of an oblong shape, rounded at the summit, somewhat narrower at its base, 3 inches long, 3 inches broad, sexstriate, smooth, and, from its weight, hanging down; its pericarp is yellow, fibrously fleshy, ½ an inch thick, lined with a thin white

[1] Bot. 'Herald,' tab. 32 (in transverse section, fig. 4).

[2] Gaertner fil. De Fructu, vol. iii. p. 229, tab. 223. figs. *b* to *f*.

[3] Plant. Guian. vol. ii. Suppl. p. 23, tab. 381.

membranaceous endocarp, is unilocular, and contains about twenty seeds, irregular in shape, imbedded in a sweet pulpy substance which fills the entire space: these seeds, subcompressed and oblong, 12 lines long, 6 lines broad, have a thin, striated, very white testa, surmounted by a laciniiform placenta, are imbedded without any order in the pulp, and by the progress of growth have been transferred from their parietal place of origin into the middle of the cell, enclosed in the pulp after the manner described in *Crescentia* (*ante*, p. 338). The exalbuminous embryo appears, from Aublet's figs. 4 and 5, to consist of two pear-shaped plano-convex cotyledons, turned back and suspended from one end of the terete radicle, of equal length.

We find a repetition of nearly all these extraordinary characters figured in Delessert's 'Icones'[1] under *Kigelea æthiopica*, Decaisne (*Kigelia pinnata*, DC.[2]). There are, however, many discrepancies in the descriptions of authors relative to the nature of the embryo in *Kigelia*. DeCandolle quotes the authority of Bojer, exemplified by his unpublished drawings, which show that the exalbuminous seeds are oblong with rounded cotyledons, externally plicated longitudinally[3]. This refers to *Kigelia pinnata*, DC.[4], which appears, from the observations of Prof. A. DeCandolle[5], to be probably identical with the *Spathodea campanulata*, Beauv.[6], from Equinoctial Africa. It is not stated from what quarter Delessert derived the information upon which he figured his analysis of the seed given in his 'Icones.' This knowledge was probably derived from Bojer's unpublished drawings alluded to. According to his analysis, the embryo is seen folded in fig. 10; it is expanded in fig. 11, where two orbicular foliaceous cotyledons, applied together, are both folded at their middle, so as to make their two halves turn towards and touch one another: in this way they appear as if suspended from one extremity of an inflected fleshy radicle of their own length—a transverse section of this within the testa being shown in fig. 9, and another transverse section of the same removed from the testa in fig. 12. All this is sufficiently manifest.

On the other hand, we have a very different version of the deve-

[1] Deless. Icon. v. tab. 95 B.
[2] Prodr. ix. p. 247.
[3] In eodem loco, p. 247.
[4] Prodr. ix. p. 247, in adnot.
[5] Prodr. ix. p. 208.
[6] Benth. Niger Flor. p. 461.

lopment of the seed in *Kigelia* by Messrs. Bentham and Hooker[1], who describe the seeds as somewhat compressed, with a coriaceous testa intruded between the lobes of the cotyledons; they are thus almost bilocular, the cotyledons being broad, flat, plicately bilobed, with a short centrifugal radicle[2], thus offering a great contrast to the long fleshy radicle figured by Delessert.

Cannot we reconcile these differences by inferring that the description of the authors of the 'Genera Plantarum' applies only to the genus *Tripinnaria*, DC. (non Persoon). This genus is not mentioned by Bentham; it was almost confounded with *Kigelia* by the elder DeCandolle. On this supposition we may regard the details given by Delessert as a true explanation of the development of the seed in *Kigelia*; and if *Tripinnaria* be accepted as a genus distinct from *Kigelia*, we may embody in its generic character the details given by Bentham and Hooker under *Kigelia*[3], viz.:—flowers large, red, arranged laxly on a pendent panicle; fruit large, subterete, indehiscent, 18 inches long, 6–7 inches in diameter, pendent from a peduncle 6–7 feet long,—characters very different from those figured by Delessert in *Kigelia æthiopica*[4].

From these details we may readily trace the analogy between the embryo of *Kigelia*, with folded flattened cotyledons, and that of *Senapea*, with fleshy plano-convex cotyledons; and, regarding these circumstances as mere generic differences, we may thus safely place *Senapea* in *Crescentiaceæ* near *Kigelia*.

The *Crescentiaceæ* would thus combine six genera:—1. *Crescentia*; 2. *Parmentiera*; 3. *Minguartia*; 4. *Kigelia*; 5. *Tripinnaria*; 6. *Senapea*.

MANAGA.

This genus of Aublet has nowhere been recognized. *Managa guianensis*, Aubl.[5], is a tree headed by a branching cope, with alternate branches furnished with alternating entire coriaceous leaves, acute at both ends, and petiolated. The inflorescence was not seen; but several globular fruits (3 to 5) proceed from the axils or extremities of the branches, each upon a distinct pedicel, and

[1] Gen. Plant. ii. p. 1053.

[2] "Testa coriacea inter lobos cotyledonum intrusa, fere 2-locularia; cotyledones latæ complicato-2-lobæ, lobis planis; radicula brevis, centrifuga."

[3] Gen. Plant. ii. p. 1053.

[4] Deless. Icon. v. tab. 93 A.

[5] Pl. Guian. vol. ii. Suppl. p. 3, tab. 369.

supported upon a small acutely 5-lobed calyx, each sepal being 3 lines long, and the slender pedicel of the same length; the fruit is $1\frac{5}{8}$ inch in diameter, smooth, yellow, variegated by red patches, with a soft thick pericarp, white and spongy within, is 2-celled, having a simple dissepiment, upon whose faces several rows of seeds are separately suspended by a short funicle; they are oblong-oval, compressed, with a finely rugous surface (*chagrinés*), the testa very hard and osseous, each enclosed in a gelatinous sac filled with a transparent fluid of a pale yellow colour, each seed containing an embryo of two cotyledons: the seeds are $7\frac{1}{2}$ lines long, 4 lines broad.

The most prominent feature in this structure is the thick pericarp, coloured outside, consisting within of a white spongy substance like the rind of an orange; but the multilocular formation of that fruit, and the axile attachment of the seeds, repel any near approach of *Managa* to *Citrus*; but other genera of the same family favour a nearer affinity. For instance, *Bergera Königii*, Wight[1], shows a bilocular ovary with several suspended ovules attached to the dissepiment, and a globular fruit[2], 2-celled, with several suspended seeds in each cell. In the same species Colebrook describes[3] its fruit as 2-celled, sometimes unilocular by abortion.

In *Claussena Willdenovii* Wight[4] describes the fruit as 2-celled, with two suspended seeds in each cell. In *Murraya exotica* Wight figures[5] a 2-celled ovary and a bilocular fruit. Finally, De Candolle describes *Glycosmis*[6] as having a fleshy fruit, 2-celled, or, by abortion, unilocular.

These instances are sufficient to demonstrate that *Managa* has many claims to vindicate its position among the *Aurantiaceæ*; indeed it would be difficult to assign it any other place.

Racaria.

This genus, established by Aublet on his *Racaria sylvestris*[7], was placed by the elder DeCandolle in *Sapindaceæ*[8], and among genera of uncertain position by Messrs. Bentham and Hooker[9].

[1] Icones, i. tab. 13. in fig. 3.
[2] Idem in fig. 6.
[3] Linn. Trans. xv. p. 368, tab. 5. fig. 4, letters *a* and *b*.
[4] Icones, i. tab. 14. fig. 5.
[5] Icones, i. tab. 96, figs. 5 and 8.
[6] Prodr. i. p. 538.
[7] Pl. Guian. ii. Suppl. p. 24, tab. 382.
[8] Prodr. i. p. 618.
[9] Gen. Plant. i. p. 392.

This is a small tree, much branched, the alternate branchlets bearing three pairs of opposite leaflets, without a terminal one, upon a long petiole bare at its base for half of its length, having above its insertion upon the branchlet three short spines. The flowers are not known; but there is an axillary shortish raceme of about six rather approximate pedicellate fruits. The fruit is an oval drupe $\frac{3}{4}$ inch long, $\frac{1}{2}$ inch broad, rounded below, pointed above, of a yellowish colour, indehiscent, the pericarp smooth, somewhat thick, softish, mucilaginous, and extremely acid; it contains three trigonous, nuciform seeds, of which two are generally abortive: the seed contains a green embryo, which is edible, having the flavour of fresh green peas; the seed is oblong, pointed, 8 lines long, 3 lines broad, having two plano-convex cotyledons.

This organization does not accord with the *Sapindaceæ*, as above remarked. To me the affinity of *Racaria* seems to point to the *Meliaceæ*, especially to those genera with indehiscent non-capsular fruits, viz. *Melia, Aglaia, Maltea, Milnea, Lansium, Sandoricum*, and *Ekebergia*.

The fruit of *Racaria* is yellowish, indehiscent, as in *Melia*; its pericarp, in like manner, smooth, and lined with fleshy soft sarcocarp; its endocarp is 3-celled instead of being 5-locular; of its 3 pyrena only one is perfected, as in *Melia*; the embryo is green, as in some *Meliaceæ*, and edible, as in *Milnea edulis*.

Upon the whole, therefore, *Racaria* appears to belong to the *Meliaceæ*.

Note on the Occurrence of a Restiaceous Plant in Cochin China.

By Maxwell T. Masters, M.D., F.R.S., F.L.S.

[Read May 1, 1879.]

Some short time since my attention was kindly drawn, by Mr. N. E. Brown of the Kew herbarium, to a supposed Restiaceous plant from Cochin China collected by M. Godefroy-Lebœuf. As the specimens were rather imperfect, I applied to M. Bureau; the Keeper at the Herbarium at the Jardin des Plantes, and through his kindness I received more complete specimens, which enabled me to ascertain that the plant in question was a species of *Leptocarpus*. The interest attaching to the discovery of a true Restiacea

in Cochin China is such as to induce me to place the fact on record in the Journal of the Society as a sequel to former contributions to the natural history of the order. Up to this time true Restiaceæ have been recorded in the Cape Colony, in Australia, New Zealand, and Tasmania, and one species has been detected in Chili. One species only has been found in the extreme north of Australia; and it is significant that this species (*L. Schultzii**) should be closely allied to the species from Cochin China. It suggests the probability that when the floras of New Guinea and other islands intermediate between the Asiatic and the Australian continents are more fully known, other species of Restiaceæ will be discovered, although up to this time I should hardly have expected that the area of distribution would extend in this particular direction.

The following is the technical description of the species, which differs from its congeners in having a monœcious inflorescence.

LEPTOCARPUS DISJUNCTUS, *Mast.*, sp. nov. Monoica, rhizomate repente excepto, glabra; culmis sulcato-striatulatis fistulosis; vaginis arcte convolutis sensim acuminatis; spiculis fasciculatis, fasciculis ad apices ramorum laxe paniculatis; bracteis ovatis acuminatis; perianthii segmentis lanceolatis.

♃. Rhizoma repens crassitie pennæ anserinæ dense lanuginosum. Culmi metrales, erecti, crassitie pennæ gallinaceæ, simplices vel parce dichotome ramosi, ramique ascendentes teretes olivacei leviter sulcato-striati. Vaginæ culmeæ arcte convolutæ 12–13 mm. coriaceæ cinnamomeæ sensim acuminatæ, superne ad margines hyalino-membranaceæ; vaginæ rameales minores foliaceo-mucronatæ. Inflorescentia laxe interrupteque paniculatim cymosa, fasciculis 3-spiculatis. Pedunculi seu paniculæ rami ascendentes glabri. Spathæ oblongo-lanceolatæ, aristatæ, coriaceæ, ferrugineæ. Spiculæ 3–4 mm. long., 1-floræ, superiores masculæ, inferiores femineæ (an semper?). Flores 2–3 mm. compressi, bractea spathiformi bracteolisque 2 minoribus suffulti. Perianthium 5–6-merum; segmenta externa oblonga acuta cymbeo-conduplicata, segmenta interiora 2 vel 3 minora planiuscula vel ad margines parum involuta. Stamina, in flore masculo, 3, libera; filamenta gracilia; antheræ ovato-oblongæ 1-loculares. Pistillodium nullum. Perianthium floris feminei conforme. Staminodia nulla. Ova-

* Bentham in 'Flor. Austral. vii. p. 237; Masters in DC. Monogr. Phanerog. vol. i. (1878), p. 343.

rium triquetrum; stylus brevis; stigmata 3, abortu 2–1, linearia longiuscula. Fructus indehiscens 1-spermus.

Habitat in insula "Phu," Cochin China, ubi detexit cl. Godefroy-Lebœuf, n. 928.

Remarks on *Carpesium* (*cernuum*?) as indigenous to Australia*. By F. Mansor Bailey, F.L.S. &c. (of Brisbane, Queensland).

[Read June 19, 1879.]

I find, by a late number of the Society's Journal (100), that Mr. Bernays, of Brisbane, brought under the notice of the Society the fact of a species of the above genus being indigenous to Queensland; but it is stated that the general feeling of the meeting was against the belief of its being indigenous to Australia, it being looked upon rather as an introduced plant. Why so? When we take into account the peculiarity of the genus choosing, as it seems, for itself, habitats at such distances apart from each other as South Europe, Caucasus, Himalaya, Malay isles, surely it is quite as likely to be indigenous as *Adenostemma viscosum*, Forst., *Soliva anthemifolia*, R. Br., *Hydrocharis Morsus-ranæ*, Linn., *Vallisneria spiralis*, Linn., *Potamogeton natans*, Linn., *P. perfoliatus*, Linn., *P. crispus*, Linn., &c., well known plants which are freely acknowleged as indigenous to Australia. With regard to the plant in question there is nothing to lead one to suppose its having been introduced. It is not showy enough for garden culture; and it possesses no adhesive hairs † to its fruit by means of which it would be likely to be carried from one place to another. I first found the plant in Aug. 1875 on "One-Tree Hill," Taylor's Range, and then traced it along the Range for a considerable distance. But never having met with the plant before, although I have been in Australia since early in 1839, and during this time noted the introduction and spread of various plants, I did not feel sure of its being indigenous until I again found it at Enaggera while on a botanical trip in company with Mr. Bernays. We both came to the conclusion that it could scarcely have been introduced at the place where we met with it. It must be borne in mind that seeds

* Extract from a letter addressed to the Secretary.

† [This statement would seem to require qualification; for it is asserted on the best authority that the achenes are remarkably viscid and adhere readily to the garments of passers.—Ed.]

of this are not such as would be likely to be eaten by birds and thus carried to a great distance, as is the case with many Solanaceous plants.

On the Lichens collected during the English Polar Expedition of 1875–76. By THEODOR M. FRIES, Professor of Botany in the University of Upsala. (Communicated by Sir JOSEPH HOOKER, C.B., F.R.S.)

[Read June 5, 1879.]

Preliminary Remarks.

LICHENOGRAPHY has made much progress during the last few decades, and in almost every respect our knowledge of the Lichens has been improved. Even the arctic forms of this class of plants have been objects of very keen investigation; and the number of species known from arctic regions is hence much greater now than it was some twenty or thirty years ago.

Nevertheless our knowledge of these plants in the most remote regions of the North, some of which were not discovered till lately, is but very small. The few that were brought from Seven Islands (80° 38′–49′ N. lat.), in the north of Spitzbergen, by Sir Edward Parry in 1827 and by A. E. Nordenskiöld in 1861, were, till a few years ago, the only described representatives of these hardy plants. In a short visit to Spitzbergen in 1868 I added a few species from above the lat. 81° N.

In the years 1860–1861, Dr. J. J. Hayes made his expedition through Smith Sound and Kennedy Channel, when he reached Cape Lieber (81° 30′ N. lat.). The plants collected on that occasion are all enumerated by E. Durand, Th. P. James, and S. Ashmed in 'Proceed. of the Acad. of Nat. Science of Philadelphia,' 1863, p. 93; their treatise afterwards appeared in Dr. A. Petermann's 'Geogr. Mittheil.' 1864, p. 487, under the title "Flora des Grinnell-Landes zwischen 78° und 82° nördl. Br." The lichens mentioned there are 23; but evidently their determination is very uncertain; or, properly speaking, it is certainly false*; added to which no localities are given, so that there is no possibility of

* Every lichenographist easily conceives that it must be impossible that *Alectoria sulcata* and *bicolor*, *Neuropogon Taylori*, *Parmelia Borreri*, etc. should exist in these regions. "*Verrucaria popularis*, Floërke," is nowhere described or even mentioned before.

determining where they were collected. As for the phanerogamous plants, Prof. A. J. Malmgren has already shown* that 9 species at the most are found on the western coast of Smith Sound; and no one of these was found to the north of Cape Isabella, situated a little beyond 78° north lat. It may be supposed that this is the case with the lichens also; and consequently it is more than probable that Dr. Hayes had not brought any lichen from a latitude more northerly than that of the Seven Islands.

By the intrepid polar traveller Julius Payer, lichens were first with certainty ascertained to occur in more northerly regions. He says† that at Cape Fligely (82° 5′), which is the northernmost point of the recently discovered Kaiser-Franz-Joseph Land reached by him, the scanty vegetation consists of only lichens, among which he names *Cetraria nivalis*, *Gyrophora hypoborea β arctica*, and *Rhizocarpon geographicum*. The other species which he cites‡ as growing in that newly discovered country were probably found in the most southern parts, between 80° and 81° N. lat.

Whether any lichens were brought home by the American 'Polaris' Expedition under Ch. F. Hall, I do not know. At least I have not succeeded in finding any information in the reports on the results of this expedition which have hitherto been published.

Thus but three species of lichens are mentioned in published works hitherto as certainly found to the north of 81° north lat.!

It is natural that under these circumstances I should gladly and with gratitude have accepted the offer made by Sir Joseph Hooker that the lichens which had been brought from the northernmost parts of the American arctic archipelago by the English Polar expedition under the command of Capt. Sir G. S. Nares (1875–76) should be examined and determined by me. The plants, it is true, cannot by brilliant colours or luxuriant forms prove attractive to the public; but they are of great interest to the botanist, and the importance that attaches to them as belonging to the flora that approaches nearest to the north pole is not their least claim to notice.

* Botan. Notiz. 1865, p. 169.

† Die österr.-ung. Nordpol-Expedition, p. 337.

‡ *L. c.* pp. 273, 274. These are only *Usnea sulphurea*, *Alectoria jubata β chalybeiformis*, *Parmelia lanata*, *Gyrophora anthracina*, *Sporastatia testudinea*, and *Buellia stigmatea* (?).

Properly speaking, these lichens form two collections, one gathered by Captain H. W. Feilden, H.M.S. 'Alert,' the other by Mr. H. C. Hart, H.M.S. 'Discovery.' As the two vessels, for the greatest part of the time, were in different places, the specimens were collected in a great number of localities—a circumstance which adds much to our knowledge of the lichen-vegetation of those regions. The lichens collected by Mr. Hart are from the following places :—

	N. lat.		N. lat.
Cape York	75° 56′	Hannah Island, Bessel Bay	81° 7′
Port Foulke	78° 18′ 19″	Polaris Bay	81° 30′ 35″
Cape Sabine	78° 40′ 45″	Discovery Harbour.	81° 42′ 45″
Alexandra Haven	78° 50′ 55″	Archer's Cairn	81° 42′ 45″
Hayes Sound	79°–79° 25′	Mount Stephenson.	81° 42′ 45″
Walrus Island, Franklin-Pierce Bay	79° 23′	Mount Discovery ..	81° 42′ 45″
Dobbin Bay	79° 45′ 50″		

The collections of Capt. Feilden are from :—

	N. lat.		N. lat.
Cape Sabine........	78° 40′ 45″	Crossing Harbour (North Greenland)..	82° 16′
Payer Harbour	78° 40′ 45″	Floeberg Beach	82° 26′ 30″
Brevoort Island	78° 47′	The Dean Mountain†	82° 26′ 30″
Norman-Lockyer Island	79° 23′	Black-Cliffs Bay	82 31′
Lincoln Bay	82° 8′	Egerton Valley......	82 40′
Cape Union*	82° 15′	Westward-Ho ! Valley	82 41′

Besides there is one species, *Gyrophora cylindrica β*, gathered by Lieutenant Pelham Aldrich on the shore of "the palæocrystic sea," the northernmost spot trodden by man, viz. Cape Columbia, situated 83° 6′ 30″, north lat.

That such material ought to be elaborated is evident. Indeed, I dare say that it has taken much more time and pains than is to be supposed from the list of species given below. Every specimen in the collection, every morsel (great or little) of stone, wood, or bone, every little piece, from a tuft of moss, has been closely

* "The lichens I collected in Cape Union were from its highest point, an altitude of 1200 feet. It was on the 28th April; I remember the occasion well; for my fingers were much frost-bitten whilst gathering them." (Capt. Feilden, *in litt.*)

† "The Dean Mountain lies inland from 'Alert's' winter-quarters some six or seven English miles, rising to an altitude of about 1400 feet. It is composed of hard indurated dark slates, thrown up at various angles, in some places the strata being vertical" (*ibid.*).

examined with a powerful lens, that not only the larger lichens, for the sake of which the specimen has been taken, should be determined, but the very smallest fragments of others, accidentally joined with them, might not escape attention. Having for many years occupied myself with arctic lichens, I have been enabled to ascertain the existence of several species in those arctic regions from an examination of one or two fruits of what could not be called a "specimen." Nevertheless all the species enumerated below are certainly, where nothing else is expressly announced, in my opinion quite correctly determined, even where the material has been so little that nothing has remained after the microscopical examination.

As soon as I began to look over these collections of lichens, I could not but observe that the higher fruticolous and foliaceous species, which persons who are not lichenologists by profession are wont to observe and gather, were represented here only by very few and undeveloped specimens. Though this may seem easily to be accounted for by the severe climate prevailing in these regions, it appeared to me a little strange, when I considered that the musk-oxen existing there must derive most of their sustenance from the lichens; it being only for a short period of the year that they get any worth mentioning from the poor phanerogamic vegetation. That the reindeer-moss (*Cladonia rangiferina*) should be quite wanting, seemed remarkable for the same reason. However, Capt. Feilden, in a letter to Prof. Oliver, has explained this circumstance: "Will you kindly inform Prof. Fries," says he, "that *Ovibos moschatus*, as far as my experience goes in Grinnell Land, does not feed on lichens; the stomachs of all these animals that I examined contained Grasses, Willows, and other phanerogamic plants, mosses (*Hypnum*), but no lichens."

Nevertheless the more developed species were not totally missing; *Gyrophoræ* especially have been brought home in as good a state as they occur on the rocks of Scandinavia. As for the lower crustaceous species, I have not been able to find any difference in their development worth remarking from that which the same species attain in much more southerly regions. There is a circumstance particularly remarkable connected with the appearance of the lichens, that Capt. Feilden has pointed out, respecting which I take the liberty to cite his own words:—"The lichen-growth, curiously enough, increased in size of species with increase in altitude. On the shore-line we met with only the smaller red,

yellow, and black and grey lichens which covered small stones and pebbles. At an elevation of 1200 feet the larger lichens were very abundant. The top of the 'Dean' was conspicuously clad with two species—the broad flat lichen, abundantly represented in my collection*, and a very delicate black plant that looks like a network of fine dark hairs†. This growth of lichens (these two species) increased at an altitude of 1400 feet. This is the highest elevation I reached when the snow had disappeared sufficiently to enable me to give any idea of the general lichen growth"‡.

From this circumstance, and from the above-mentioned development of most species, we need not hesitate to conclude that lichenscan thrive much further to the north than man has hitherto succeeded in advancing. I am convinced that, without the least credit being given to an open polar sea (existing, no doubt, only in fancy), a lichen vegetation may exist at the very pole if there is land or only rocks free from snow or ice for only a short period of the year.

The lichens that have been collected by the English Polar Expedition are mostly of such species as are already known from the arctic regions. However, it is not without a little surprise that I have also found among them some species which were known before only from much more southern regions. Added to which I have reason to suppose that some of the forms are entirely new, and have not hitherto been found. They are described below.

It is well known that, having regard to their different habits of living, lichens are distinguished as growing on stone, wood, moss, and earth. To speak of real wood-lichens in arctic regions is impossible, of course, as no trees are to be found there. Only some smaller fragments of wood of *Salices*§ are in the

* *Gyrophora discolor*, Th. Fr.

† *Parmelia lanata* (L.). Wallr.

‡ The following lichens (most of them in a bad condition) have been found on stones and earth from an altitude of 1200 feet on Cape Union:—*Cetraria nivalis, Parmelia lanata, Physcia pulverulenta β. muscigena, Gyrophora discolor, Caloplaca elegans β. tenuis, C. jungermanniæ, Rinodina turfacea, R. exigua β. confragosa, Lecanora varia β. polytropa, L. Hageni, L. gibbosa, Blastenia atrocyanescens, Sporastatia testudinea, Lecidea leucophæa β. griseoatra, L. ænea, L. paupercula, L. Dicksonii, Buellia parasema β. muscorum, Rhizocarpon chionophilum,* and *R. geminatum*, as well as *Endococcus perpusillus* and *Polycoccum Sporastatiæ.* In East Greenland Payer found a *Gyrophora* (probably *G. discolor*) at an altitude of 7000 feet above the level of the sea.

§ As the giant among these may be considered a piece of dead stem without bark, of *Salix arctica*, labelled "From 'Alert's' winter-quarters, 82° 27′. This is the finest piece of indigenous timber that I have yet met with in Grinnell

collection. Most of the species growing on them are such as are generally considered muscicolous; but there are also among them some which elsewhere are wont to appear as saxicolous. This agrees with an observation that I made in Spitzbergen, viz. that a great many of the lichens that grow on wood which has been brought there either by men or by ocean-streams, are the same as those which appear on the surrounding rocks. I think that the reason is the capacity of wood in the arctic regions to resist decay or any sort of destruction. It is, as it were, "*ære perennius*;" and in this respect wood surpasses most sorts of stones, which are split asunder or otherwise destroyed by the joint action of water and frost.

Some old bones with lichens growing on them have also been collected. It might be supposed that these lichens would be identical with those growing elsewhere on calcareous rocks; but this is not the case, for almost all of them are muscicolous under normal circumstances.

Finally, it is my duty to say that, though the number of species enumerated below cannot be thought small when their arctic native country is considered, it does not include all that have been brought home; for there are some sterile crusts that it is impossible to determine, together with some few apothecia, which I have occasionally found isolated among other species.

*List of the Lichens collected**.

1. ALECTORIA OCHROLEUCA (*Ehrb.*), *Nyl.*, *a.* RIGIDA (*Vill.*), *Th. Fr.*

In the neighbourhood of the winter-quarters of H.M.S. 'Alert;' Payer Harbour; Alexandra Haven; Cape Sabine. Always sterile; some specimens from 82° 27′ 30″ N. belong to a forma *gracilenta*. Is sometimes so dark that one might easily take it for the next.

2. ALECTORIA NIGRICANS (*Ach.*), *Nyl.*

Westward-Ho! Valley; winter-quarters of H.M.S. 'Discovery;' Alexandra Haven. Sterile.

Land.—H. W. F." Its length is now about 5·5 centims. On a transverse section of about 1·2 centim. diam., nearly 40 annual circles of very different size have been counted.

* A small number collected at the Danish settlements in Greenland are included in this list.

3. ALECTORIA DIVERGENS (*Ach.*), *Nyl.*

Cape York, sterile.

4. STEREOCAULON PASCHALE (*L.*), *Fr.*

Hayes Sound, sterile fragments.

5. STEREOCAULON TOMENTOSUM (*Fr.*) β. ALPINUM (*Laur.*), *Th. Fr.*

Winter-quarters of 'Discovery' and Mount Discovery, sterile.

6. STEREOCAULON EVOLUTUM, *Græwe*, β. FASTIGIATUM (*Anzi*), *Th. Fr.* ?

Alexandra Haven. The specimen being sterile, exact determination is impossible.

7. STEREOCAULON DENUDATUM, *Flörk.*, β. PULVINATUM (*Schær.*), *Fw.*

Cape Sabine, sterile.

8. CLADONIA COCCIFERA (*L.*), *Schær.*, f. phyllocladiis stramineis, squamæformibus et dein verrucoso- vel subpulverulento-dissolutis, confertis, crustam crassiusculam formantibus; podetiis pyxidatis, verrucosis; apotheciis non evolutis.

Cape York, on mouldering mosses. The hydrate of potash produces a yellow reaction, which colour is rendered permanent by the immediate application of hypochlorite of lime.

9. CLADONIA PYXIDATA (*L.*) β. POCILLUM (*Ach.*), *Fr.*

In the neighbourhood of the winter-quarters of 'Alert' (also at an altitude of 400–500 feet) and 'Discovery;' Norman-Lockyer Island; Alexandra Haven; Cape Sabine. Only phyllocladia and podetia: no apothecia.

10. THAMNODIA VERMICULARIS (*Sw.*), *Ach.*

Winter-quarters of 'Alert' and 'Discovery;' Hayes Sound.

Var. β. TAURICA (*Wulf.*), *Schær.* 82° 27′ 33″ N.; Walrus Island, Franklin-Pierce Bay; Cape Sabine.

11. CETRARIA ISLANDICA (*L.*), *Ach.*

In the vicinity of Floeberg Beach; Port Foulke. Sterile.

12. CETRARIA HIASCENS (*Fr.*), *Th. Fr.*

Cape Sabine, a very miserable and sterile fragment.

13. CETRARIA NIVALIS (*L.*), *Ach.*

The neighbourhood of Floeberg Beach; Cape Union, at an altitude of 1200 feet (low-grown); Discovery Bay; Alexandra Haven. Always sterile.

14. Cetraria Fahlunensis (*L.*), *Schær.*
Cape York; without apothecia.

15. Parmelia saxatilis (*L.*), *Fr.*
Brevoort Island; sterile, but otherwise perfectly developed.

Var. *β.* omphalodes (*L.*), *Fr.* Alexandra Haven, sterile.

16. Parmelia physodes (*L.*), *Ach.*
Winter-quarters of 'Alert' (f. *obscurata*, Ach.) and 'Discovery,' on mosses and old wood, sterile.

17. Parmelia encausta (*Sm.*), *Nyl.*, *β.* intestiniformis (*Vill.*), *Th. Fr.*
Westward-Ho! Valley, sterile, on pebbles.

18. Parmelia olivacea (*L.*), *Ach.*
On mosses and stones, sterile: Floeberg Beach; Westward-Ho! Valley; Mount Stephenson. Thallus more or less sprinkled with very minute verrucæ, even so abundantly that it might be mistaken for *Lopadium pezizoideum.* In the stratum medullare no reaction by the hypochlorite of lime (=CaCl−).

Var. *β.* prolixa, *Ach.* Alexandra Haven, a small and sterile fragment with narrow laciniæ. Thallus CaCl.

19. Parmelia lanata (*L.*), *Wallr.*
Summit of Cape Union (1200 f.); Westward-Ho! Valley; Alexandra Haven; Cape York. Always sterile.

20. Parmelia separata, n. sp. Thallo crustaceo-cartilagineo, laxe adhærente, ochroleuco vel vetusto passim in lividum vergente, opaco, subtus nigricante et fibrillis longis nigricantibus passim dense vestito; laciniis confertis subimbricatisque, angustis, leviter convexis; apotheciis non visis.
Westward-Ho! Valley, on mosses.
This is in some respects intermediate between *P. conspersa* and *P. centrifuga*, resembling the former most in characters, the latter in habitat. The above description shows, however, how readily it may be distinguished from both. It may be added that the thallus by the hydrate of potash or the hypochlorite of lime, or these combined, neither externally nor internally changes colours; nor do the hyphæ give a bluish tint with the aqueous solution of iodine. Epithallus, when old, rimuloso-diffract. The underside of the laciniæ pale at the tips, without fibrils, smooth, or with few darker papillæ. Thallus not, as that of *P. conspersa*, sprinkled with black punctiform spermogonia, but, on the contrary, pre-

senting an abundance of small wax-coloured or finally yellowish-brown points and verrucæ, which are probably spermogonia, though no spermatia are found in them.

21. PHYSCIA PULVERULENTA (*Schreb.*) β. MUSCIGENA (*Ach.*), *Nyl.*

82° 27′ 40″ N. (well and typically developed, and also a forma *microphylla, imbricata*); Cape Union; winter-quarters of 'Discovery;' Polaris Bay (forma adeo angustifolia et albo-suffusa, ut pro *P. cæsia* haberi posset; K=); Walrus Island, Franklin-Pierce Bay.

22. PHYSCIA STELLARIS (*L.*) β. TRIBACIA (*Ach.*), *Nyl.*

On stones and destroyed vegetables, among other lichens, sterile. Egerton Valley, Black-Cliffs Bay, Westward-Ho! Valley, and other localities in the vicinity of Floeberg Beach; Walrus Island, Franklin-Pierce Bay.—Laciniæ ejusdem speciminis nunc (soli expositæ) obscuriores, griseæ (K=), nunc albidæ (K±).

Var. γ. MARINA, *E. Nyl.* (Physcia leptaleodes, *Nyl. Flora*, 1874, p. 306). Winter-quarters of 'Discovery,' sterile. Thallus K^{+}_{+}.

23. PHYSCIA CÆSIA (*Hoffm.*), *Nyl.*

In the neighbourhood of the winter-quarters of 'Alert,' especially on sandstone, very well developed though sterile. Thallus K^{+}_{+}, but on the upperside scarcely changed.

24. XANTHORIA PARIETINA (*L.*) β. AUREOLA (*Ach.*), *Th. Fr.*

On rocks, sterile: Walrus Island, Franklin-Pierce Bay; Cape Sabine.

25. XANTHORIA LYCHNEA (*Ach.*) α. PYGMÆA (*Bor.*), *Th. Fr.*

Sterile, on rocks; Westward-Ho! Valley; 82° 35′ N.

26. GYROPHORA CYLINDRICA (*L.*), *Ach.* Apotheciis normaliter gyroso-plicatis.

Cape Sabine (one specimen, showing transition to var. β).

β. SIMPLEX, *Th. Fr. Spitsb.* p. 32 (Gyrophora Tramnitziana. *Körb. Deutsch. Polarf.* ii. p. 76). Apotheciis simplicibus vel centro modo leviter papillatis, extus (excipulo) strato corticali tectis; sporis ellipsoideis, 0·012 mm. longis et 0·006–0·007 mm. crassis.

A luxuriant (11 centim. long) specimen from Cape Sabine; another, somewhat smaller, but pretty well developed, from

the northern face of Cape Columbia. Thallus CaCl –. *Gyrophora rugifera*, Nyl., scarcely differs from this variety.

27. Gyrophora erosa (*Web.*), *Ach.*

Alexandra Haven; a small, very miserable specimen.

Obs. In Zw. Deutsch. Polarf. ii. p. 77, Prof. Körber describes as new "*Gyrophora Koldeweyi.*" However, this species depends only on a perfectly erroneous observation. The thallus is indicated as "cæsio-cinerascens vel albicans," with the addition, "im Alter der Flechte verfärben sich auf krankhafter Weise die anfangs schön bläulich-weissgrauen Thallusläppchen in Dunkelbraune." On the contrary, this supposed species consists of extremely small young specimens of *G. erosa*, which by lying for a long time in water mingled with ice*, have been for the most part destroyed. The dark thallus is normal and still living, while the white is quite dead and therefore "fragillimus, humectatus flaccidus, mollissimus." The hyphæ and gonidia in the darker parts of the thallus are in a normal state; but in the white the hyphæ are in complete dissolution, the gonidia discoloured, and impossible to discern, etc.

28. Gyrophora hyperborea (*Hoffm.*) β. arctica (*Ach.*), *Mudd.*

Cape Sabine (the largest of these specimens is 3 centims. in diam., well developed, with apothecia); Cape York.

29. Gyrophora proboscidea (*L.*), *Ach.*

Alexandra Haven, tolerably well developed.

30. Gyrophora discolor, *Th. Fr. Spitsb.* p. 31.

Summit of the Dean Mountains, at an altitude of 1350 feet (the largest specimen 2 centims. in diam.); Westward-Ho! Valley; top of Cape Union; Polaris Bay; Cape Sabine; Payer Harbour (4·5 centims. in diam.); Cape York. Thallus CaCl =. Fruits only very young.

31. Caloplaca elegans (*Link.*) α. typica, *Th. Fr.*

On rocks and (fragments) on mosses. Floeberg Beach; Black-Cliffs Bay; Westward-Ho! Valley; Discovery Bay; Mount Stephenson; Walrus Island, Franklin-Pierce Bay (abundantly fructiferous); Brevoort Island; Cape York, on bones.

* It is mentioned as growing "an granitischen, wie es scheint vom Wasser rundlich abgespülten Steinen."

Var. β. tenuis (*Wrbg.*), *Th. Fr.* In many places in the vicinity of Floeberg Beach; summit of Cape Union; Discovery Bay; Polaris Bay; Hannah Island, Bessel Bay; Cape Sabine.

On the underside of a stone from Crossing Harbour there are, where hidden from the sunshine, fragments of this lichen with entirely white thallus, quite wanting chrysophanic acid, but containing green gonidia in abundance. Only round the young apothecia a slight yellow colour is to be observed, which by the hydrate of potash changes into rosy.

32. Caloplaca cerina (*Ehrh.*), *Th. Fr.*

On mosses, old bones, and wood of *Salix*. Floeberg Beach; Westward-Ho! Valley; Discovery Bay; Cape Sabine.

Obs. Callopisma mydaleum, Körb. Zw. Deutsch. Polarf. ii. p. 78, differs, according to the original specimens, in nothing essential from *Caloplaca cerina*.

33. Caloplaca celata, n. sp. Crusta tenuissima, disperse verruculosa, cinerea vel obsoleta; apotheciis parvis, confertis, primum concavis, dein planiusculis, margine thallode crassiusculo, elevato, subintegro vel repando, cinereo persistenter cincto; disco nigricante, tenuiter pruinoso; paraphysibus apice capitulo dilute livido violascenteve instructis; sporis ellipsoideis vel ovoideis, polari-diblastis.

On old bones, very rare at Floeberg Beach; a few apothecia on mosses at the same locality.

In its habit so completely does it resemble a young *Rinodina turfacea* that it was with great surprise that I found it did not belong to that plant. Among the *Caloplacæ* it is doubtless most nearly allied to *C. cerina*; but so far as I can judge from the few and small specimens, it is clearly distinguished, especially by the colour of the disk and the tips of the paraphyses.—Apothecia ad 0·7 mm. diam. metientia. Hypothecium incoloratum; paraphyses facillime liberæ, ramosæ, apicem versus articulatæ, capitulo instructæ K intensius distincteque violascente nec roseo; asci inflato-clavati; sporæ 8næ, 0·010–0·013 mm. longæ, 0·005–0·007 mm. crassæ.

34. Caloplaca citrina (*Hoffm.*), *Th. Fr.*

On sandy earth in the vicinity of 'Alert's' winter-quarters.

35. Caloplaca pyracea (*Ach.*), *Th. Fr.*

On stones, mosses, bones, old wood, sprigs of willows and

other destroyed vegetables. In sundry places in the vicinity of 'Alert's' winter-quarters; Mount Stephenson; Polaris Bay; Walrus Island, Franklin-Pierce Bay; Cape Sabine. The specimens being small and incomplete, the determination, perhaps, is not always quite certain.

36. CALOPLACA JUNGERMANNIÆ (*Vahl*), *Th. Fr.*

On mosses, more rare on old wood and bones. Cape Union, altit. 1200 feet; many localities in the vicinity of Floeberg Beach; Discovery Bay; Cape Sabine.

37. CALOPLACA FERRUGINEA (*Huds.*) β. NIGRICANS (*Tuckerm.*), *Th. Fr.*

On old wood of *Salix* at the winter-quarters of 'Alert;' on mosses at the same place (f. in var. *cinnamomeam*, Th. Fr., vergens).

38. CALOPLACA VITELLINA (*Ehrh.*), *Th. Fr.*

On rocks: Westward-Ho! Valley; Polaris Bay; Cape Sabine.

39. CALOPLACA SUBSIMILIS, *Th. Fr.*

On stones, old bones, mouldering mosses, wood, and other vegetables. In many places in the vicinity of Floeberg Beach; Egerton Valley; Polaris Bay; Crossing Harbour; Cape Sabine.

40. RINODINA TURFACEA (*Wrbg.*), *Th. Fr.*

Forma *orbata*, Ach., at Cape Union, altit. 1200 feet, on mosses; Floeberg Beach, on mosses and old bones; Alexandra Haven, on mosses.—*F. roscida* (Smrft.), Th. Fr., on mosses at Floeberg Beach; Discovery Bay; Polaris Bay; Walrus Island, Franklin-Pierce Bay; Alexandra Haven. On every one of these localities only few apothecia, mingled among other lichens.

Obs. *Rinodina Panschiana*, Körb. Zw. Deutsch. Polarf. ii. p. 78, is nothing but *R. nimbosa* (Fr.), Th. Fr., apotheciis nudis.

41. RINODINA MNIARÆA (*Ach.*) β. CALCIGENA, *Th. Fr.*

A few apothecia mingled among other lichens, on stones from many places in the vicinity of 'Alert's' winter-quarters; Greenland, 82° 6′ N.; Polaris Bay; Discovery Bay.

42. RINODINA EXIGUA (*Ach.*) β. CONFRAGOSA (*Ach.*), *Th. Fr.*

Top of Cape Union, only two apothecia among other lichens.

43. ACAROSPORA CHLOROPHANA (*Wrbg.*), *Mass.*

Westward-Ho! Valley, sterile.

44. Lecanora (Placodium) fulgens (*Sw.*), *Ach.*, *β.* alpina, *Th. Fr.*

On dead mosses in the vicinity of Floeberg Beach.

45. Lecanora (Placodium) chrysoleuca (*Sm.*), *Ach.*, *β.* melanophthalma (*DC.*) *Th. Fr.*

Westward-Ho! Valley.

Obs. In Zw. Deutsch. Polarf. ii. p. 79, this species occurs under the name of "*Lecanora atrosulphurea.*"

46. Lecanora pallescens (*L.*), *Schær.*

On mosses, well developed (f. *Upsaliensis*, L.): Westward-Ho! Valley.

47. Lecanora subfusca (*L.*), *Ach.*

Var. *hypnorum* (Wulf.), Schær., on mosses, old bones, and wood in many localities at Floeberg Beach; Westward Ho! Valley; Walrus Island, Franklin-Pierce Bay; Alexandra Haven. A saxicolous form, approaching to var. *cenisea* (Ach.), is found at Discovery Bay.

48. Lecanora Hageni (*Ach.*), *Körb.*

The principal form on mosses from the Dean Mountain, at an elevation of 900 feet, and Cape Union, altit. 1200 feet; on old wood from Floeberg Beach; on stones from Crossing Harbour; on old bones from Cape Sabine.

Var. *β.* roscida (*Smrft.*), *Th. Fr.* Apotheciis nigricantibus, plus minus pruinosis.

On mosses and other destroyed plants (f. *Saxifragæ*, Anzi), mouldering willows, stones, and old bones. Westward-Ho! Valley; many localities in the vicinity of Floeberg Beach; Discovery Bay; Mount Stephenson; Polaris Bay; Cape Sabine; Walrus Island, Franklin-Pierce Bay. Perhaps this variety ought rather to be referred to *L. albescens* or *dispersa.*

49. Lecanora albescens (*Hoffm.*), *Th. Fr.*

Well developed (apotheciis pallidis) at Floeberg Beach on stones and hard naked sandy earth; in the same locality a forma macra apotheciis nigricantibus vel olivaceo-nigrescentibus, showing transition to **L. dispersa*; Westward Ho! Valley, on stone (a miserable fragment, apotheciis demum nigricantibus, pruinosis vel denudatis); Mount Stephenson (forma in *β.* transiens); Cape

Sabine, on old bones; Cape York, also on bones (in β. transitum præbens).

Var. β. CÆSIOALBA (*Körb.*), *Th. Fr.* A few apothecia on stones from Floeberg Beach.

50. *LECANORA DISPERSA (*Pers.*), *Flörk.*

On stones, scattered apothecia from 82° 45′; Westward-Ho! Valley; Floeberg Beach; Egerton Valley; Discovery Bay; On old bones from Cape Sabine; on old wood of *Salix* from Westward-Ho! Valley and Floeberg Beach.

51. LECANORA VARIA (*Ehrb.*), β. POLYTROPA (*Ehrb.*), *Nyl.*

Saxicolous. Top of Cape Union; Westward-Ho! Valley; Floeberg Beach; Discovery Bay; Cape York. A little different from Cape Sabine.

52. LECANORA VERRUCOSA (*Ach.*), *Laur.*

On mosses: Floeberg Beach; Westward-Ho! Valley.

53. LECANORA CALCAREA (*L.*), *Smrft.*

Floeberg Beach: Polaris Bay; Dobbin Bay.

54. LECANORA GIBBOSA (*Ach.*), *Nyl.*

Floeberg Beach; summit of Cape Union (apotheciis non evolutis); Discovery Bay; Greenland, 82° 6′ N.; Cape Sabine.

Var. β. SQUAMATA (*Flot.*), *Th. Fr.* Floeberg Beach; Crossing Harbour.

Obs. A very young, thin form of this variety is *Aspicolia rosulata*, Körb. Zw. Deutsch. Polarf. ii. p. 79.

55. LECANORA FLAVIDA, *Hepp.*

Cape Sabine; winter-quarters of 'Alert.'

56. PERTUSARIA CORIACEA, *Th. Fr. Spitsb.* p. 21; *Lich. Scand.* p. 318.

Westward-Ho! Valley. Thallus without apothecia, but with spermogonia. The determination, however, not dubious.

57. BILIMBIA HYPNOPHILA (*Ach.*), *Th. Fr.*

In the neighbourhood of the winter-quarters of 'Discovery;' only 3–4 apothecia.

58. BILIMBIA VERECUNDA, *Th. Fr. Lich. Scand.* p. 387.

A few apothecia on mosses in the vicinity of Discovery Bay. Only once found before, in Finmark (Norway) on bark of *Populus tremula*; and therefore a description of the plant taken in

Grinnell Land may here be inserted:—Crusta tenuissima, albida, vel fere obsoleta; apothecia minutissima, sessilia, plana, tenuiter marginata, atra, nuda; hypothecium incoloratum; paraphyses facile liberæ, capitulo magno subgloboso obscure fusco terminatæ; asci clavati; sporæ lineari-oblongæ, utrinque obtusæ, tetrablastæ, 0·012–0·016 mm. longæ et 0·003–0·004 mm. crassæ; gelatina hymen. iodo præcedente cærulescentia sordide rubens.

59. Blastenia atrocyanescens, *Th. Fr. Lich. Scand.* p. 395.
A single apothecium on a stone from the top of Cape Union.

60. Biatorella (Sporastatia) testudinea (*Ach.*), *Mass.*
Egerton Valley; Westward-Ho! Valley; Floeberg Beach; Cape Union, altit. 1200 feet; Polaris Bay. All the specimens brought home by the Expedition belong to the form *coracina* (Smrft.).

61. Biatorella (Sarcogyne) simplex (*Dav.*), *Br. & Rostr.*
The form *strepsodina* (Ach.). Winter-quarters of 'Alert' (82° 27′–82° 45′ N.); Mount Stephenson; Polaris Bay; Crossing Harbour; Cape Sabine; Cape York. The form *herpes*, Norm., on limestone at Floeberg Beach.

62. Lecidea (Psora) rubiformis, *Wrbg.*
Winter-quarters of 'Discovery.'

63. Lecidea (Psora) decipiens (*Ehrb.*), *Ach.*
Very pretty specimens in the neighbourhood of the winter-quarters of 'Alert' (82° 27′–82° 30′ N.).

64. Lecidea (Biatora) rupestris (*Scop.*), *Ach.*
Some few apothecia on stones from Floeberg Beach and Walrus Island, Franklin-Pierce Bay.

65. Lecidea (Biatora) ænea, *Duf.*
Poor fragments on one stone from the top of Cape Union.

66. Lecidea (Biatora) leucophæa (*Flörk.*) β. griseoatra (*Flot.*), *Th. Fr.*
Cape Union, altit. 1200 feet; Floeberg Beach; Polaris Bay.

67. Lecidea (Biatora) tornoënsis, *Nyl.*
Alexandra Haven; 2–3 apothecia on destroyed vegetables.

68. Lecidea paupercula, *Th. Fr.*, β. acrogena, n. var. Hy-

pothecio pallidiore (sordide infuscato), sporis paullo minoribus (0·007–0·012 mm. longis, 0·004–0006 mm. crassis).

Summit of Cape Union; a single specimen.

69. Lecidea elata, *Schær.*

Winter-quarters of 'Alert;' Polaris Bay; Cape Sabine.

70. Lecidea Dicksonii, *Ach.*

Cape Union, altit. 1200 feet; Cape Sabine; Alexandra Haven.

71. Lecidea elæochroma (*Ach.*), *β.* muscorum (*Wulf.*), *Th. Fr.*

Alexandra Haven, on mosses.

Var *γ.* pilularis (*Dav.*?), *Th. Fr. Lich. Scand.* p. 543.

Forms on stones crusta obsoleta vel parum evoluta. Egerton Valley; Westward-Ho! Valley, and other localities in the vicinity of the winter-quarters of 'Alert;' Discovery Bay; Mount Stephenson; Polaris Bay (f. crusta alba, apotheciis planiusculis marginatis); Crossing Harbour. On naked clay at Polaris Bay. Some specimens belong, or approach more or less, to the form *acrocyanea*, Th. Fr. Lich. Scand. p. 547.

On sandstone at Floeberg Beach is found a form very peculiar in its habitus, crusta tartareo-amylacea, maculas vel valleculas formante dispersas niveas; apotheciis solitariis, confertis vel seriatim conjunctis, demum convexis et varie tuberculato-repandis. Quite similar to *L. lapicida* f. *seriata*, Th. Fr. At the first sight the apothecia resemble those of *L. auriculata*, Th. Fr.

Obs. L. hansatica, Körb. Zw. Deutsch. Polarf. ii. p. 80, differs in no way from common forms of *L. elæochroma γ. pilularis*, except by a pale yellowish thallus, and cannot possibly be separated as a species. It is not improbable that this tint of colour was not to be found in the growing plant, but appeared during its preservation in some moist place, which may easily happen, especially on board ship.

72. Lecidea crassipes (*Th. Fr.*), *Nyl.*

Two apothecia on mosses from the winter-quarters of 'Alert.'

73. Lecidea vorticosa (*Flörk.*), *Körb.*

Westward-Ho! Valley; Floeberg Beach; Polaris Bay; Cape Sabine; Alexandra Haven.

74. Lecidea cyanea (*Ach.*), *Th. Fr.*

Floeberg Beach; Discovery Bay; Polaris Bay. All the col-

lected specimens approach β. *polaris*, Th. Fr.,* though the thallus is rather thin.—Hyphæ strati medullaris iodo intense cærulescunt; K thallum colore non mutat; hypothecium omnino incoloratum; sporæ ellipsoideæ, 0·008–0·010 mm. longæ et 0·004–0·005 crassæ.

75. LECIDEA AURICULATA, *Th. Fr.*, β. DIDUCENS (*Nyl.*), *Th. Fr.*
Discovery Bay and Polaris Bay.

76. *LECIDEA BRACHYSPORA, *Th. Fr. Lich. Scand.* p. 501.
In the vicinity of Floeberg Beach, a single small specimen.

77. LECIDEA SCROBICULATA, *Th. Fr.* Crusta crassa, contigua, verrucis jugisve inæquali, supra plus minus rimosa insuperque tenuiter rimulosa, albida, sordide ochroleuca argillaceave; hyphis non amyloideis; apotheciis majusculis, atris, disco scabridis, primum sessilibus adnatisve, planiusculis et marginatis, demum elevatis sæpeque quasi pedicellatis, convexis, immarginatis, varie flexuosis tuberculatisque; sporis minutissimis vel subminutis, globosis vel globoso-ellipsoideis.

On stones in many localities in the vicinity of Floeberg Beach, even at an altitude of 500 feet; Lincoln Bay.

From *L. elata*, as a subspecies, under which I, in 'Lich. Spitsb.' p. 41, described this plant, it is very distinct, and of a very peculiar habit. It is much more allied to *L. brachyspora*. To complete the above-given diagnosis may be added:—Thallus usque ad 5 mm. et ultra crassus, neque K neque Ca Cl tinctus; apothecia 1–2 mm. lata, adultiora verrucis elevatis vulgo insidentia, unde quasi pedicellata, subtus plus minus distincte pallida; hypothecium omnino incoloratum; paraphyses graciles, cohærentes, apice plus minus obscure olivaceo- vel smaragdulo-fuligineæ; asci clavati; sporæ 0·006–0·008 mm. longæ et 0·005–0·006 mm. crassæ vel diam 0·005–0·006 mm. metientes; gelatina hymen. iodo cærulescens, dein nonnihil sordidescens; spermatia acicularia, recta (vel leviter curvula), 0·012–0·014 mm. longa.

78. LECIDEA DESPECTA, n. sp. Crusta tenui, rimuloso-diffracta, albida, hypothallo cæsio imposita, vel indistincta; hyphis medullaribus non amyloideis; apotheciis sessilibus, diu planiusculis et margine crassiusculo cinctis, demum nonnihil convexis margine extenuato exclusove; hypothecio omnino incolorato; paraphysibus

validiusculis, laxe cohærentibus, fuligineo-clavatis; sporis minutis vel submediocribus, ellipsoideis.

On stones in the vicinity of Floeberg Beach.

A scarcely remarkable form, most resembling poor forms of *L. lapicida*, or still more of *L. auriculata*. From both it differs by hyphæ non amyloideæ; other essential characters may be obtained from the apothecium, the paraphyses, and the size of the spores. Thallus K –; apothecia circ. 1 mm. diam. metientia, vulgo regularia, omnino atra, margine incurvo; asci clavati; sporæ 8næ, 0·009–0·012 mm. longæ et 0·005–0·006 mm. crassæ; gelatina hymen. iodo intense persistenterque cærulescens.

With this species may perhaps be united an evidently abnormal *Lecidea* from Walrus Island, Franklin-Pierce Bay, much infested by *Endococcus pygmæus*, with indistinct hypothallus, a rather more developed thallus, forming small separate or confluent spots on the stone, and few convex apothecia. The internal structure does not differ.

79. Lecidea ultima, n. sp. Crusta tenuissima, disperse verrucosa, albida; apotheciis parvis, sessilibus, diu planis et tenuiter marginatis, demum leviter convexis immarginatisque; hypothecio obscure rubricoso; paraphysibus gelatinam fere libere percurrentibus, aliis gracilibus, aliis validis et capitulo clavave majuscula fuscescente instructis; sporis minutis, breviter ellipsoideis vel subglobosis.

On stones from several localities around Floeberg Beach; a few apothecia at every place, mingled among other lichens.

Belongs to the group of *L. sylvicola*; but is distinguished from all affined species by the nature of the paraphyses and the size of the spores, as well as the gelatina hymenea, by iodine intensely and permanently bluing.—Apothecia diam. ad 0·6 mm. lata, atra vel raro tenuissime albo-pruinosa. Thecium plus minus (præcipue apicem versus) cærulescenti- vel olivaceo-obscuratum; paraphyses apice articulatæ; asci subcylindrici; sporæ fere uniseriatæ, 0·006–0·008 mm. longæ et 0·005–0·006 mm. crassæ vel subglobosæ, diam. 0·006–0·007 mm.

80. Lecidea —— (non determinanda).

On sandstone in the vicinity of Floeberg Beach; only 3–4 apothecia among other lichens.

Probably not yet described; but to propose a new species upon only a few apothecia seems to me rather too auda-

cious. The description is, in short, the following:—Crusta fere obsoleta; apothecia parva, convexa, atra, verrucæ thallinæ albidæ adnata; hypothecium incoloratum; paraphyses gelatinoso-concretæ confluentesve, apice obscure violascentes; asci breves, ventricosi; sporæ minutæ (forsan nondum maturæ); gelatina hymen. iodo intense persistenterque cærulescens. Thecio (etsi angustiore) cum *L. petrosa* fere congruit.

81. Buellia parasema (*Ach.*) β. muscorum (*Schær.*), *Th. Fr.* On mosses and old wood of *Salices*. Westward-Ho! Valley; Floeberg Beach; Discovery Bay; Cape Union, altit. 1200 feet.

Var. γ. papillata (*Smrft.*), *Th. Fr.* On old bones and wood in the vicinity of Floeberg Beach. In the same locality on mosses a middle form between *β. muscorum*, *γ. papillata*, and *δ. albocincta*.

82. Buellia vilis, *Th. Fr. Spitsb.* p. 44.

Some few apothecia on stone at the winter-quarters of the 'Alert.'

Obs. Orphinospora grœnlandica, Körb. Zw. Deutsch. Polarf. ii. p. 81, is only an undeveloped state of *Buellia moriopsis* (Mass.), Th. Fr., growing in a dark place, crusta parum evoluta, verrucis supra hypothallum dendriticum sparsis. On the contrary, *B. Payeri*, Körb. ibid. p. 80, seems to be quite a distinct species, the description of which, according to the original specimens, is the following:—Crusta crassiuscula, areolato-verrucosa, verrucis leviter convexis, epithallo rimuloso, cinerascentibus, K—; hyphæ iodo cærulescentes; apothecia diam. ad 1 mm. lata, primum innata, dein adpressa thallumque paullo superantia, plana tenuiterque marginata vel demum leviter convexa immarginata, nuda, scabrida; thecium 0·090–0·140 mm. altum; hypothecium fuscum; paraphyses gelatinoso-conglutinatæ, apice fuligineæ vel nonnihil vergentes in atropurpureum (qui color, ut etiam in excipulo, K intensior evadit); asci inflato-clavati (minime "mox evanidi"); sporæ 8næ, ellipsoideæ vel breviter ellipsoideæ, utrinque obtusæ (immixtis abnormiter evolutis, fere globosis), diblastæ, nigricantes, 0·011–0·015 mm. longæ et 0·006–0·008 mm. crassæ; gelatina hymen. iodo intense cærulescens.

83. Buellia (Diplotomma) alboatra (*Hoffm.*), *Th. Fr.*

On stones: Westward-Ho! Valley (apotheciis nudis); Floeberg Beach (apotheciis pruinosis).

84. Rhizocarpon (Catocarpon) chionophyllum, *Th. Fr. Lich. Scand.* p. 612.

Winter-quarters of 'Alert;' Cape Union, altit. 1200 feet; Polaris Bay.

85. Rhizocarpon (Catocarpon) Rittokense (*Helb.*), *Th. Fr.*

Cape York; sterile, but the determination certain.

86. Rhizocarpon geographicum (*L.*), *DC.*

Egerton Valley, Westward-Ho! Valley, and other localities in the vicinity of 'Alert's' winter-quarters; Cape Sabine; Alexandra Haven.

87. Rhizocarpon geminatum (*Fw.*), *Th. Fr.*

Westward-Ho! Valley; Egerton Valley; Floeberg Beach; summit of Cape Union; Polaris Bay; Cape York.

Obs. Rhizocarpon inops, Körb. Zw. Deutsch. Polarf. ii. p. 81, is nothing but a young *R. geminatum*, growing on places almost inaccessible to the sunshine, and therefore with a crusta tenuissima, verrucis dispersis. The "lacteus" colour which is attributed to these verrucæ depends on the same cause as the similar colour of "*Gyrophora Koldeweyi*," growing in company therewith (see p. 355); for the verrucæ are quite dead, the hyphæ in a state of dissolution, and the gonidia destroyed.

88. Rhizocarpon endamyleum, *Th. Fr. Lich. Scand.* p. 627.

A little fragment from Cape Sabine.

89. Rhizocarpon grande (*Flörk.*), *Arn.*, *β.* quaternarium, n. var. sporis normaliter quaternis.

A single small specimen from Alexandra Haven.

Accords externally completely with *R. grande*; the verrucæ scattered on a black hypothallus, K—, I—. The inner parts of the apothecia are as follows:—Hypothecium obscure fuscum; paraphyses graciles, gelatinam copiosam percurrentes, apice rubenti-nigricantes et K intense purpurascentes; sporæ normaliter 4næ, interdum 3næ vel 5næ, ellipsoideæ, oblongæ vel elongato-oblongæ, rectæ vel curvulæ, utrinque obtusæ, obscuræ, halone hyalino lato circumdatæ, 0·032–0·048 mm. longæ et 0·012–0·018 mm. crassæ; gelatina hymen. iodo intense cærulescens.

90. Dermatocarpon —— (non determinandum).

A small and sterile fragment from Westward-Ho! Valley,

probably grown on stone. Perhaps *D. botularium* (Nyl.), or a new species.

91. Microglena sordidula, n. sp. Crusta tenuissima, rimulosa, sordide pallideque subochracea; apothecia parva, verrucis thallinis semiimmersis; amphithecio ceraceo-molli, subcinnamomeo, depresso-hemisphærico, centro umbilicato-depresso; perithecio pallido; sporis 8nis, parvis.

On stone at Discovery Bay; a single and minute specimen.

A small plant, very distinct from all species known to me, in its habit most resembling *M. Cella*, Th. Fr., which, however, differs by its much larger spores and other characters.—Apothecia 0·2–0·4 mm. lata; amphithecium humidum multo pallidius. Paraphyses simplices, gracillimæ, gelatinam libere percurrentes; asci subinflati; sporæ ellipsoideæ vel globoso-ellipsoideæ, murales, incoloratæ, 0·015–0·020 mm. longæ et 0·007–0·009 mm. crassæ. Iodo contentus ascorum brunnescit.

92. Polyblastia bryophila, *Lönnr.*

On mouldering vegetables around the winter-quarters of 'Alert' and 'Discovery.' Spermogonia punctiformia, nigra; spermatia breviter bacilliformia, 0·004–0·005 mm. longa, circ. 0·001 mm. crassa.

93. Polyblastia intercedens (*Nyl.*), *Lönnr.*

On limestone and other calcareous rocks in several localities around Floeberg Beach, Polaris Bay, Dobbin Bay. The fruits of these specimens show perithecium tenuiter nigrum; amphithecium semiglobosum; anaphyses longæ, graciles; sporæ 8næ, ellipsoideæ, oblongæ vel dacryoideæ, polyblastæ, incoloratæ, 0·024–0·036 mm. longæ et 0·012–0·016 mm. crassæ; gelatina hymen. iodo vinose rubens.

94. Verrucaria phæothelena, n. sp. Crusta macra, e verrucis parvis, dispersis, obscure fuscis formata; apotheciis parvis, adnatis vel semiimmersis; perithecio globoso, nigro; amphithecio crasso, hemisphærico vel centro leviter depresso umbilicatove; sporis ellipsoideis, minutis.

In the vicinity of Floeberg Beach, on sandstones containing lime.

Desiring to avoid adding a new species to a genus which already contains too many badly defined forms, I have made every effort to find some already described species with which

this could be connected, but in vain. By its small spores it agrees with *V. striatula, microspora*, &c.; but its thallus is of so very different a nature that they are rather to be referred to different groups.—Crusta sæpe lente detegenda, mollis, sed minime gelatinosa; verrucæ interdum nonnihil inæquales. Apothecia circ. 0·3 mm. lata. Sporæ 8næ, 0·009–0·012 mm. longæ et 0·004–0·006 crassæ. Gelatina hymenea iodo vinose rubet.

95. Peltigera canina (*L.*), *Schær.*

In several localities in the neighbourhood of 'Alert's' winter-quarters, also fertile; Discovery Bay and Mount Discovery, sterile; Hayes Sound, fertile.

96. Peltigera scabrosa, *Th. Fr. Lich. Arct.* p. 45.

In the vicinity of Floeberg Beach and on the Dean Mountain, altit. 900 feet, in both places sterile; from Dobbin Bay, so young that it is like a cupular *Peziza*.

97. Lecothecium asprellum (*Ach.*), *Th. Fr.*

In many places in the vicinity of Floeberg Beach, on stone. All specimens sterile, and most of them badly developed; hence the determination is not quite certain.

98. Collema pulposum (*Bernh.*), *Ach.*

Floeberg Beach; some small and sterile fragments.

99. Leptogium tetrasporum, *Th. Fr. Vet.-Ak. Förh.* 1864, p. 276.

Some few apothecia on earth from the Dean Mountain, altit. 900 feet. Sporæ quaternæ, plurimæ 0·032–0·045 mm. longæ et 0·016–0·019 mm. crassæ, minoribus etiam immixtis.

100. Leptogium Schraderi (*Bernh.*), *Nyl.*

A few small fragments on earth at the winter-quarters of 'Alert;' the determination, however, uncertain.

101. Gyalecta Peziza (*Mont.*), *Anzi.*

Only three apothecia, from turfy earth at Hayes Sound. The description of the inner structure of the apothecia is as follows:—Excipulum gonidia magna concatenata abunde fovens; thecium circ. 0·075 mm. altum; hypothecium incoloratum; paraphyses distinctæ, etsi gelatina cohærentes, confertæ, apice levissime incrassatæ incoloratæque; asci clavati vel cylindrico-clavati; sporæ 4–8næ, subfusiformes, tetrablastæ, incoloratæ, 0·015–0·018 mm.

longæ et 0·004–0·005 mm. crassæ; gelatina hymen. iodo colore cæruleo fugace dilutissime tingitur.

102. MICROTHELIA MELANOSTIGMA, n. sp. Crusta vix ulla; apotheciis minutissimis, hemisphæricis vel depresso-subglobosis, nigris; amphithecio perithecium distinctum parenchymaticum fuscum fere omnino includente; sporis ex ascis cito ejectis, 8nis, diblastis, ovoideis, loculo inferiore minore angustioreque, mox obscuris, minutis.

On stones in the vicinity of Floeberg Beach, very rare.

Together with *Rinodina aterrima*, Krempel., *Buellia anthracina*, Anzi, *Microthelia Metzleri*, Körb., *Verrucaria scopularia*, Nyl., and *Microthelia atramentea*, Norm., this little plant forms a very natural group, the place of which in the system, as well as the relation between the species above mentioned, will be examined on another occasion.—Apothecia 0·1–0·2 mm. lata, saxo nigro insidentia ideoque non nisi lente valde augente detegenda; amphithecium sat crassum, microscopio inspectum obscure fusconigrum, parenchymaticum; paraphyses nullæ distinctæ; asci inflato-clavati, pauci, cito disrupti (sporas maturas ascis inclusas invenire non potui); sporæ utrinque obtusæ, mox nigro-fuscæ et halone pertenui hyalino circumdatæ, 0·010–0·014 mm. longæ et 0·005–0·007 mm. crassæ; gelatina hyalina iodo leviter cærulescens.

APPENDIX.

Upon the lichens the following parasites have been observed:—

1. LECIOGRAPHA CONVEXA, *Th. Fr. Lich. Arct.* p. 234.

Mount Stephenson, on the thallus of *Caloplaca elegans*, which was killed by it. The interior parts of the apothecia accord with those of *Buellia alboatra*, as will be seen from the following description:—Hypothecium obscure fuscum; paraphyses leviter cohærentes, apicem versus sæpe crassiores et capitulo nigricante terminatæ; asci inflato-clavati; sporæ 8næ, ellipsoideæ vel oblongo-ellipsoideæ, utrinque obtusæ, primum tetrablastæ, dein uno alterove loculo longitudinaliter divisæ, mox obscuratæ, nigricantes, 0·012–0·021 mm. longæ et 0·007–0·009 mm. crassæ; gelatina hymen. iodo cærulescens.

2. Conida fusca (*Mass.*), *Th. Fr.*

On stones in the vicinity of Floeberg Beach; Walrus Island, Franklin-Pierce Bay; Cape York.

This plant, formerly referred to *Arthronia* or *Coniangium*, has certainly no developed thallus, and grows on several other more or less developed lichens, which are thereby deformed in the same manner as I have indicated in 'Lich. Scand.' p. 343, in the case of *Arthronia phæobæa*, Norm. Sporæ 0·015–0·018 mm. longæ et 0·006–0·008 mm. crassæ, episporio subgelatinoso crassiusculo.

3. Conida clemens, *Tul.*

On a single apothecium of *Lecanora Hageni*, 'Alert's' winter-quarters.

4. Endococcus perpusillus, *Nyl.*

On *Lecanora varia* β. *polytropa* and *calcarea*, as well as on several sterile crusts of lichens in many places in the vicinity of 'Alert's' winter-quarters; Cape Union, altit. 1200 feet; Cape Sabine; Alexandra Haven.—Sporæ in ascis inflatis 8næ, ellipsoideæ, diblastæ, 0·012–0·015 mm. longæ et 0·006–0·008 mm. crassæ; gelatina hymen. iodo intensius dilutiusve violascens vel violascenti-rubens.

5. Endococcus pygmæus (*Körb.*), *Th. Fr.*

In many places around Floeberg Beach; Discovery Bay; Polaris Bay; Walrus Island, Franklin-Pierce Bay; Cape Sabine; Crossing Harbour; Cape York. On *Caloplaca elegans*, *Lecanora varia* β. *polytropa*, *Lecidea elata*, *elæochroma*, and *brachyspora*; also on some sterile crusts.—Sporæ in ascis inflato-clavatis numerosissimæ, ellipsoideæ vel suboblongæ, medio vix constrictæ, diblastæ, 0·005–0·008 mm. longæ et 0·003–0·004 mm. crassæ; gelatina hymen. iodo leviter vinoso-rubens.

6. Endococcus triphractus, *Nyl.*

Cape York, on a sterile crust so poor that the apothecia seem to arise from the very stone. This form may be named *nuda*.—Apothecia subglobosa, 0·2 mm. circ. lata, medio nonnihil umbilicato-depressa; paraphyses nullæ; anaphyses pro ratione validiusculæ; sporæ in ascis sat angustis, subcylindricis vel medio crassioribus 8næ, oblongæ vel elongato-oblongæ, utrinque obtusæ, rectæ vel curvulæ, tetrablastæ (immixtis paucis simplicibus diblastisque), nigricantes, 0·012–0·018 mm. longæ et 0·004–0·005 mm. crassæ;

gelatina hymen. iodo colore dilutissime roseo tincta, præcedente cærulescentia levissima fugacissima.

7. Polycoccum Sporastatiæ (*Anzi*), *Arn.*

Cape Union, altit. 1200 feet, on the thallus of *Sporastatia testudinea.*—Apothecia immersa; paraphyses distinctæ, numerosæ, graciles; sporæ in ascis ventricosis 8næ, subellipsoideæ vel ovoideæ diblastæ, altero loculo angustiore, demum nigricantes, 0·018–0·020 mm. longæ et 0·009–0·010 mm. crassæ; gelatina hymen. iodo violascens.

8. Sphæria ——*.

Westward-Ho! Valley, on areolæ of *Rhizocarpon geographicum*, which are killed and made white by it.—Apothecia parva, immersa, atra; paraphyses copiosæ, ramosæ; asci cylindrico-clavati; sporæ 4næ, una serie dispositæ, oblongæ, utrinque obtusæ, tetrablastæ, ad septa (præcipue medium) nonnihil constrictæ, in unoquoque loculo guttulam oleosam centralem lateralemve (rarius duas magnitudine similes dissimilesve) foventes, obscure fuscæ, 0·028–0·032 mm. longæ et 0·009–0·010 mm. crassæ. Iodo paraphyses fulvescunt, contentus ascorum rufescit.

9. Sphæria ——.

In the vicinity of Floeberg Beach, on a sterile saxicolous crust. —Apothecia parva (ad 0·2 mm. lata), adnata vel semiimmersa, primum subglobosa, dein varie corrugata et apice quasi discissa, atra; paraphyses graciles, ramosæ, anastomosantes; asci cylindrico-clavati; sporæ 4–6næ, una serie dispositæ, ellipsoideæ, medio constrictæ, utrinque obtusæ, diblastæ, 0·015–0·017 mm. longæ et 0·007–0·009 mm. crassæ. Iodo non mutatur, nisi quod contentus ascorum fulvescit vel brunnescit.

10. Sphæria ——

Westward-Ho! Valley, on dead parts of the thallus of *Thamnolia vermicularis.*—Apothecia minutissima, tantum lente valde augente detegenda, hyphis nigricantibus toruloideis imposita, atra; paraphyses nullæ distinctæ; asci ventricosi; sporæ 8næ, ovoideæ vel oblongo-ovoideæ, utrinque obtusæ, diblastæ, incoloratæ, 0·015–0·018 mm. longæ et 0·005–0·007 mm. crassæ. Iodo insigniore modo non mutatur.

* On account of a deficient knowledge of Mycology, I have thought proper not to give names to the following three species, though most probably all are new to science.

Notes on *Moquilea*, with the Description of a new Species. By John Miers, F.R.S., F.L.S., &c., Dignit. et Commend. Ord. Bras. Rosæ.

[Read April 3, 1879.]

Licania differs from *Moquilea* more widely than has been suspected; for the two genera have been often confounded together. In their floral structure a notable difference exists. In *Licania* one half of the stamens are fertile and unilateral, the rest are anantherous, and all are seated consecutively upon the margin of an elevated membranaceous deciduous ring. On the other hand, in *Moquilea* the stamens vary in number in the several species, are altogether free and distinct to their base, uniserially seated in the mouth of the short calyx and most frequently exserted, all bearing versatile anthers, their number varying from 40 to 5.

It is, however, in the different organization of the fruit and seed that the greatest difference exists between the two genera.

The fruit of *Licania*, according to Aublet, at first very thick and fleshy, becomes hard and ligneous; in the fresh state the pericarp is lined with a white fleshy coating, which is edible and of a sweet taste; it is 13 lines long, 7 lines in diameter; it is furnished within with rigid hairs (filandreux): the fleshy lining vanishes in drying; and it then adheres firmly to the nucleus, which is unilocular and monospermous, of a pointed oval shape, 6 lines long, 3 lines broad, is osseous and contains a dicotyledonous embryo.

The fruits in other species of *Licania* are variously described by Mr. Bentham, and perhaps denote the existence of several yet undefined genera. In one species the fruit is obovate, pyriform, ligneo-coriaceous, containing an erect seed with a membranaceous testa, with an embryo having thick fleshy plano-convex cotyledons*. My analysis of *Licania prismatocarpa*† may serve to throw additional light on the subject.

Here the fruit is pentagonally cylindrical, subcostate at the angles, falcately attenuated and incurved at the base, obtusely pointed at the summit; including the stipitiform base it is 13 lines

* Gen. Plant. i. p. 606.

† Flor. Bras. fasc. 42, p. 19.

long, $4\frac{1}{2}$ lines in diameter: the pericarp is fuscous, $\frac{1}{2}$ line thick, is hard, with transverse ligneous cellules; it contains a single seed, which is erect, nearly as long as the cell, and, though once filling its space, is now reduced in size by drying, being 10 lines long and 2 lines broad. The seed is of a dark brown colour, and when cut open shows in the middle a white embryo, 6 lines long, formed of two extremely thin, almost pellicular cotyledons 4 lines long, 1 line broad, the inferior slender radicle being 2 lines long; after its removal the fleshy envelope in which it was imbedded shows, inside of each half, an impressed figure of the embryo; as this envelope shows no indication of a raphe or chalaza, it must be albumen; for the spiral vessels of the raphe were observed in the integument which lines the pericarp.

The existence of albumen in the seed of *Licania* is not singular in the family, as it exists in *Hirtella*, as was well demonstrated by Gaertner*; this was acknowledged by DeCandolle†. Kunth, in 1828‡, considered that the albumen of Gaertner consisted merely of two large foliaceous cotyledons of the embryo, conferruminated together along their margins; this supposition was adopted by Endlicher in 1840§. This theory was disproved by my analysis of two species of *Hirtella* examined by me in a living state: the first was mentioned on a former occasion‖; the second is shown in my analysis of *Hirtella Pohlii* from the Corcovado: in the latter case the albumen is 6 lines long, 3 lines broad, enclosing an embryo with a small basal radicle and two very thin oblong white cotyledons 3 lines long, 1 line broad. The presence of albumen in the seed of these two species of *Hirtella* is therefore incontestable.

The structure of the fruit of *Licania glabra*, Mart. (*L. costata* Spruce)¶ shows many points of analogy between it and *L. prismatocarpa*. The drupe is of considerable size, seated upon a peduncle terminated by two minute, recurved, almost obsolete bracts. In the flower the small urceolated calyx grows to a large size. The fruit is ovate, $1\frac{1}{4}$ inch long, 1 inch broad, marked by 8 or 10 prominently costate ridges: the ferruginously tomentose pericarp is hard, composed of numerous ligneous cellules; it is unilocular, and contains a nucleus considerably reduced in size by drying, and is attached to the base of the cell by a small hilum.

* Fructus, iii. p. 40, tab. 185.
† Prodr. ii. p. 528.
‡ H. B. K. vi. p. 274, tab. 565.
§ Gen. Plant. p. 1252.
‖ Journ. Linn. Soc.
¶ Fl. Bras. fasc. 42, p. 10.

This nucleus is globular, with a small nipple (chalaza) at its apex; it has a roughish surface, is 7½ lines in diameter, the indurated integument being closely agglutinated to it; it is solid, and when cut transversely exhibits a homogeneous hard dark albumen, showing in the axis a longitudinal chink, corresponding to the position of the slender embryo in *Licania prismatocarpa*; but here the embryo cannot be seen on account of its extreme tenuity, and I did not like to injure my specimen in searching for it.

My analysis of the fruit of *Licania heteromorpha** shows a very analogous structure.

I will now proceed to show the very different organization of the fruit of *Moquilea*. I first observed it in examining that of *M. Turiuva*†. This species is well described by Sir J. Hooker, who noted the size of the fruit but did not analyze it.

The fruit is a dry drupe, fusiform in shape, 13 lines long, 4½ lines broad in the middle, acute at the summit, shortly narrowing at the base to a breadth of 1½ line, where it fits into the hollow of the persistent almost unchanged calyx, which is 5-toothed to its base; the pericarp, ⅛ line thick, is fuscous brown, opaque, coriaceous, and when macerated gives out a red dye; it is unilocular and monospermous. The most ready way of examining its structure is in its dry state, without softening it by maceration, when, by making two opposite longitudinal incisions through the pericarp alone, it becomes separated into two halves without difficulty. In one half will be found the nucleus, covered by part of the integument of the seed, the other half of the integument remaining adherent to the inside of the other moiety of the pericarp. The integument or testa thus severed is found to be bilamellar in that part where the raphe is confined within it. The raphe thus exposed to view is seen to be a network of longitudinal bundles of numerous fine spiral vessels, with other threads or bundles anastomosing with them, forming a reticulated network quite white. The integument at its summit is terminated by a polished, fleshy, conical chalaza. The embryo, after the integument is removed, appears like a solid body, cylindrical, somewhat pointed at its chalazal extremity, obtuse at its base, faintly grooved longitudinally; it is 10 lines long, 2½ lines broad in the middle; in its

* Flor. Bras. fasc. 42, p. 11.

† *Licania Turiuva*, Cham. & Schlect. Linnea, ii. p. 550. *Licania aperta*, Benth. in Hook. Journ. Bot. ii. p. 218. *Licania pubiflora*, Benth. *l. c.* p. 219. *Moquilea turiuva*, Hook. in Flor. Bras. fasc. 42, p. 25.

transverse section. It is solid for some distance within the periphery, and across it an indistinct line shows where the margins of the two cotyledons are there agglutinated together, while in the centre it is hollow, where the cotyledons are free from one another; a minute inferior radicle is hidden in the base of the cotyledons.

The new species mentioned in the title may be thus described:—

MOQUILEA ORGANENSIS, nob. Ramulis glabris, subtenuibus: foliis elliptico-oblongis, imo repente acutis, et in petiolo subdecurrentibus, apice in acumen acutum subito contractis, subcoriaceis, supra pallide ferrugineis, nervis immersis, subtus fere concoloribus, nervis fuscis adscendentibus costaque prominentibus, venis transversim reticulatis, undique glabris, nisi in junioribus, unde pilis mollibus luteo-albis sparse pubescentibus, petiolis canaliculatis limbo 12–15plo brevioribus: racemis axillaribus, subremote alternatim spicatis, puberulis; floribus parvis, aggregatis, sessilibus: drupa sicca, majuscula, late obovata, convexa, vix compressa, imo breviter stipitata, calyce 5-dentato persistente et fere immutato suffulta, 1-locularis, monosperma; seminis structura illæ *Moquileæ Turiuvæ* valde analoga. In montibus Organensibus: *v. v. et sicca* in herb. meo 4095.

I found this plant in February 1838. It has much the habit of *Moquilea Turiuvæ*. Its slender branches are glabrous; its leaves, $\frac{3}{4}$ inch apart, are $3\frac{1}{2}$–$4\frac{1}{2}$ inches long, including the acumen of 6 lines, $\frac{3}{4}$–$1\frac{1}{2}$ inch broad, on channelled petioles 3 lines long; spikes of the inflorescence $\frac{1}{2}$–$\frac{3}{4}$ inch apart, $1\frac{1}{4}$ inch broad, supported on a bare peduncle $\frac{1}{2}$ inch long; flowers in bud $\frac{3}{4}$–1 line in diameter; drupe $1\frac{1}{2}$ inch long, 1 inch broad, 9 lines thick in the cross direction, rounded at the summit, suddenly narrowed at its base for the length and breadth of nearly 2 lines, where it is seated in the persistent calyx; the pericarp is opaque, minutely roughened, 2 lines thick, formed of reticulated ligneous fibres, is hard: the seed fills the cell, is covered by a brownish red polished testa, marked by prominent nervures corresponding with the branches of the imbedded raphe; it is 11 lines long, 8 lines broad. When the opening of the pericarp is properly managed, the testa may be split so as to show the imbedded beautifully snow-white raphe in a fine network of anastomosing spiral vessels, occupying an area of nearly half a square inch. The exalbuminous embryo, nearly as long as the testa, is oblong, obtuse, subcompressed, formed of two thick fleshy cotyledons agglutinated together at

their margins, leaving a hollow space in the axis, where they do not adhere together. I must not omit to mention that when a transverse section of the seed is made (not previously macerated), the embryo is white, extremely hard, with the texture of cow-horn, or nearly as dense as ivory.

A Contribution to the Flora of Northern China.

By J. G. Baker, F.R.S., F.L.S., and S. Le M. Moore, F.L.S.

[Read June 19, 1879.]

(Plate XVI.)

In October 1877 there reached Kew a collection of 600 specimens, made by Mr. John Ross in the province of Schin King, the most northerly portion of the Celestial Empire, and situated between latt. 40° and 42° N. Owing to the unfrequented nature of this province, and to the rich returns which have accrued to explorers in neighbouring parts of Eastern Asia, it was our hope to be able to note, by way of excursus, some facts of geographical interest. The collection, as a whole, is by no means devoid of noteworthy points, as is sufficiently evinced by the discovery of such forms as *Exochorda serratifolia* (an addition to a genus that has for years remained monotypic), *Saxifraga Rossii*, *Brachybotys paridiformis*, and *Betula exalata*. Withal many of the specimens prove to be duplicates, such a number are in too fragmentary a state to come to any decision about*, and the flora of Eastern Asia is being so rapidly augmented by the labours of Maximowicz, Hance, Franchet, and others as to cause the invalidation of any code of results after a very short period. Hence we have relinquished our original intention, and content ourselves with laying before the Society a list with localities of such of the species as could be determined, together with descriptions of those which seem new to science.

Ranunculaceæ.

Clematis paniculata, *Thbg.* West of Chienshan; Jaoling.

Anemone hepatica, *L.* (hairy form). Kwandien mountains.

* Among the fragments, we may notice a new *Prunus*, near *P. japonica*; a curious *Centaurea* (§ *Rhaponticum*), an apparently undescribed Rhododendron near *R. dilatatum*, Miq.; a very large-fruited *Ulmus* or *Holoptelea*, seemingly quite different from any thing hitherto known, several Willows, Carices, &c.

ANEMONE CERNUA, *Thbg.* Exposed south side of Fungwhang-shan. Common on good soil on mountains all over Manchuria.

A. CERNUA, *Thbg.*, var. Sandy bottom of narrow valley west of Ngauyang; flowers pale lilac.—Foliis minus incisis, floribus quam in exempll. typicis minoribus siccitate brunneis.

A. ALTAICA, *Fisch.* Mountain shades east of Funghwangchung.

A. (§ *Anemonanthea*) ROSSII, *S. Moore*, sp. nov. (Pl. XVI. figs. 1 & 2.) Pilosiuscula, foliis radicalibus solitariis (an semper?) longe petiolatis, petiolo tenui basi haud dilatato, lamina ternatim secta segmentis obovatis varie incisis interdum bifissis, scapo tripollicari, involucro 3-lobo vel 3-phyllo, lobis vel phyllis valde inæqualibus incisis aut si minimis subintegris, pedunculo involucrum superante vel subæquante, floribus parvulis, sepalis 5 ovalibus, filamentis filiformibus, carpellis octo oblongis hirsutis.

Hab. in sylvis ad latera collium prope Funghwangchung.

Ex affinitate *A. baicalensis*, Turcz., abs qua abhorret foliis, floribus minoribus, carpellis hirsutis. *A. flaccida*, Schmidt, quacum planta nostra melius comparari debet, distat ob involucrum omnino diversum et flores minores et stamina pauciora.

ADONIS APPENINA, *L.*, var. DAVURICA, *Ledeb.* Corean Gate; shady foot of mountain. Woods south of Corean Gate.

RANUNCULUS SCLERATUS, *L.* Dry sandy bed of Hwun River, west of Sarhoo. Roadside, Chienshan.

R. ACRIS, *L.* Woody hill south of Hingjing. Marshy valleys, Yoongdien and elsewhere.

R. REPENS, *L.* East of Monkden.

R. PENNSYLVANICUS, *L.* (R. chinensis, *Bge.*). Chienshan.

R. AURICOMUS, *L.* Moist hill-side, east of Funghwangchung.

CALTHA PALUSTRIS, *L.* Marshy valley, Yoongdien. Marshy ground east of Corean Gate.

ERANTHIS STELLATA?, *Maxim.* Narrow valleys east of Funghwangchung, in woody shade. The specimen is a dwarf one, and in an early fruiting condition.

PÆONIA ALBIFLORA, *Pall.* East of Fooling.

P. OREOGETON, *S. Moore* (sp. nov.). Caule flexuoso, foliis longe petiolatis biternatis, foliolis membranaceis lanceolato-

obovatis, lateralibus subsessilibus, terminali longius petiolato, omnibus facie superiore glabris inferiore appresse pilosulis, carpellis duobus oblongis glabris, stigmatibus brevibus recurvis haud retortis.

Hab. Kwandien ad latera montis.

Radix deest. Foliola iis *P. obovatæ*, Maxim., sat similia. Flores circiter 9 cm. diam. Petala elliptica, an lutea?

Distat a *P. obovata*, Max., numero præcipue vero forma carpellorum stigmatibusque haud retortis, forsan itaque petalorum colore; a *P. Wittmanniana*, Hartm., carpellis oblongis glabris.

MENISPERMACEÆ.

MENISPERMUM DAVURICUM, *DC.* Jaoling, Fungwhangshan and elsewhere.

BERBERIDEÆ.

EPIMEDIUM VIOLACEUM, *Dne. & Morr.* Label of locality mislaid.

E. MACRANTHUM, *Dne. & Morr.* Hill-sides from Changdien to Quandien; seen nowhere else.

JEFFERSONIA DUBIA, *Bth. & Hook. f.* (Plagiorhegma, *Maxim.*). Woody valleys south of Corean Gate. Fungwhangshan.

BERBERIS CHINENSIS, *Desf.* South of Hingjing. East of Fooling. Sarhoo.

LEONTICE MICRORRHYNCHA, *S. Moore*, sp. nov. (Pl. XVI. figs. 3 & 4). Subspithamæa, glabra, caule ascendente, foliis floralibus bis ternatim sectis interdum fere biternatis vel segmentis inæqualiter arguteque trilobis segmentis ultimis oblongis vel oblongo-oblanceolatis obtusis emarginatis vel obscurissime cuspidatis basi truncatis vel levissime cordatis venosis membranaceis, stipulis magnis, bracteis amplis, pedicellis gracilibus saltem duplo brevioribus, sepalis obovatis 5mm. longis, petalis haud visis, staminibus quam sepala paullo brevioribus, ovario ovoideo, stylo brevissimo, ovulis duobus, capsula depresso-subglobosa valvulis quinque subæqualibus acutis ad medium dehiscente, seminibus duobus compressis.

Hab. in provincia Schin King loco non indicato.

L. altaica, Pall. discedit foliis floralibus diversiformibus crassioribus, stipulis minoribus, floribus majoribus, capsulis majoribus 4-spermis valvulis brevioribus ac latioribus.

LEONTICE MICRORRYNCHA, var. VENOSA. (Pl. XVI. fig. 5.) Humilior, foliis floralibus integris vel inæqualiter bilobis lanceolatis.

Hab. in montibus prope Kwandien mense Apr. florens.

PAPAVERACEÆ.

CHELIDONIUM MAJUS, *L.* Changdien. Fooling. Corean Gate.

STYLOPHORUM JAPONICUM, *Miq.* Shady hill-side east of Funghwangchung.

FUMARIACEÆ.

DICENTRA SPECTABILIS, *DC.* Mountains of Saimaji.

CORYDALIS AUREA, *Willd.*, var. SPECIOSA, *Rgl. & Maack.* Narrow mountain-gorges east of Funghwangchung. Kwandien valley.

C. REMOTA, *Fisch.* Shady woods forty miles east of Funghwangchung.

C. REMOTA, *Fisch.*, var. LINEARILOBA. Dry mountain-sides, Fungwhangshan.

C. SOLIDA, *Sm.*, *α.* TYPICA. Shady mountain-woods forty miles east of Funghwangchung. Marshy ground west bank of Yaloo, about N. lat. 42°.

C. SOLIDA, *Sm.*, *β.* ROTUNDILOBA. Dry mountain-side, Fungwhangshan.

CRUCIFERÆ.

CARDAMINE MACROPHYLLA, *Willd.* Kwandien. Chienshan.

NASTURTIUM PALUSTRE, *DC.* West of Sarhoo.

DRABA NEMOROSA, *L.* Jaoling. Exposed south side of Fungwhangshan.

DONTOSTEMON DENTATUS. *Bge.* Chienshan.

THLASPI ARVENSE, *L.* Fooling. South of Hingjing. Jaoling.

LEPIDIUM LATIFOLIUM, *L.* Chienshan.

L. RUDERALE, *L.* East of Fooling. Monkden.

CAPSELLA BURSA-PASTORIS, *L.* Fields south of Corean Gate. Changdien valley.

VIOLACEÆ.

VIOLA BIFLORA, *L.*, var. stipulis parvis deltoideis. Valley east of Funghwangchung. Small shady stream-bank among hills south of Corean Gate.

V. PATRINII, *DC.* Changdien, Quandien mountains, and elsewhere.

V. CANINA, *L.*, β. ACUMINATA. Fooling.

V. CANINA, *L.*, var. West of Ngaiyang. A form intermediate between *α. typica* and *β. acuminata*, having the habit of the former and the sparse pubescence of the latter.

V. PINNATA, *L.*, var. DISSECTA, *Turcz.* Kwandien mountains. Walls and hill-sides, Yoongdien.

V. VERECUNDA, *A. Gray.* Chienshan.

V. VARIEGATA, *Fisch.* Dry bank of small stream south of Corean Gate. Valley east of Funghwangchung.

V. HIRTIPES, *S. Moore*, sp. nov. (Pl. XVI. fig. 6.) Quadripollicaris, foliis ovatis e basi profunde cordatis in petiolum elongatum marginatum piloso-hirtum attenuatis margine crenatis glabris, stipulis circiter ad medium adnatis, pedunculo tenui folia æquante piloso-hirto sub flore glabro, bracteis linearibus juxta medium pedunculum glabris, sepalis firmis lanceolatis acutis vel acutiusculis 5-nerviis glabris, auriculis brevibus deltoideis, flore magno forsan pallide violaceo, petalis lateralibus barbatis, calcari magno obtuso, ovario puberulo, capsula ——.

Hab. in montibus prope Kwandien mense Apr. florens.

V. phalacrocarpæ, Maxim. proxima, abs qua ut ex descriptione optima patet foliis glabris sepalisque lanceolatis discedere videtur. Ab omnibus varietatibus *V. Patrinii*, DC., cujus formam aberrantem priusquam esse existimavi, distat pedunculis pilosis, sepalis firmioribus conspicue nervosis brevius auriculatis, floribus majoribus, necnon aliis notis.

POLYGALACEÆ.

POLYGALA SIBIRICA, *L.*, var. TENUIFOLIA. Chienshan. Jaoling.

P. JAPONICA, *Thbg.* Corean Gate; Changdien hill-sides.

Caryophylleæ.

Silene aprica, *Turcz.*, var. (S. Oldhamiana, *Turcz.*). East of Fooling.

Stellaria aquatica, *Fries* (sub *Malachio*). Chienshan.

Tiliaceæ.

Tilia mandshurica, *Rupr. & Max.* Chienshan. "Dwanmoo Tree."

Oxalideæ.

Oxalis obtriangulata, *Max.* Shady gully, Kwandien mountains.

O. acetosella, *L.* Modaoling.

O. corniculata, *L.* Chienshan.

Rutaceæ.

Dictamnus Fraxinella, *Pers.* West of Hingjing.

Ailanthus glandulosa, *Desf.* Chienshan.

Celastrineæ.

Euonymus Bungeanus, *Max.* Chienshan.

E. Thunbergianus, *Bl.* Fungwhangshan.

E. Thunbergianus, *Bl.*, var. Hingjing. Folia subtus secus nervos puberula.

Rhamnaceæ.

Rhamnus crenatus, *S. & Z.* Chienshan.

Zizyphus vulgaris, *Lamk.*, var. inermis. Chienshan.

Sapindaceæ.

Acer Sieboldianum, *Miq.*, var.? Changdien. Differs from the type by reason of the larger more hairy tegmenta, young leaves clothed as in *A. japonicum*, and apparently shorter pedicels. It is perhaps a new species intermediate between *japonicum* and *Sieboldianum*; but the specimen is in too unsatisfactory a state to warrant doing any thing further with it.

Acer pictum, *Thbg.*, var.? Kwandien. The lobes of the leaf are obscurely lobulate, and the nerves pubescent on the underside. "Sai tree."

AMPELIDEÆ.

VITIS PENTAPHYLLA, *Thbg.* Jaoling.

V. AMURENSIS, *Rupr.* Jaoling, on trees, but often covering rocks. Sweet small grape.

LEGUMINOSÆ.

MELILOTUS PARVIFLORA, *Desf.* Fooling.

INDIGOFERA MACROSTACHYA, *Bge.* Chienshan. (Forma parva.)

ASTRAGALUS CHINENSIS, *L. fil.* West of Chienshan.

VICIA PSEUDO-OROBUS, *Fisch. & Mey.*, var.? Remarkable from the more numerous and larger leaflets and longer and stronger tendril than in the type. There is also no diminution in the number of the leaflets proceeding upwards. It may possibly be a new species.

OROBUS LATHYROIDES, *L.* Chienshan.

LATHYRUS PALUSTRIS, *L.*, var. Jaoling. Foliolis angustis, 2-vel 4-jugis cirris fere obsoletis.

ROSACEÆ.

RUBUS CRATÆGIFOLIUS, *Bge.* Chienshan.

PRUNUS TOMENTOSA, *Thbg.* Saimaji.

P. PSEUDOCERASUS, *Lld.* Mountains north of Saimaji.

P. PADUS, *L.*, var. PUBESCENS. Jienchang.

P. SSIORI, *Schmidt.* Woods of Fooling.

P. JAPONICA, *Thbg.* Kwandien mountains. Mountains Corean Gate, Funghwangchung, and elsewhere.

EXOCHORDA SERRATIFOLIA, *S. Moore* (*Hook. Ic. Pl.* t. 1255). Narrow gully beside mountain-stream, west of Hingjing. Found nowhere else.

POTENTILLA SUPINA, *L.* West of Chienshan.

P. MULTIFIDA, *L.* Jaoling. Fooling.

P. CHINENSIS, *Ser.* Chienshan.

P. FLAGELLARIS, *Willd.* Sarhoo.

GEUM STRICTUM, *Ait.* Chienshan.

Rosa multiflora, *Thbg.* Chienshan.

R. davurica, *Pall.* West of Chienshan.

Pyrus baccata, *L.* North of Saimaji. South of Hingjing, and elsewhere.

P. chinensis, *L.* Kwandien mountains, Jaoling.

Cratægus pinnatifida, *Bge.* Fooling. Chienshan.

Saxifrageæ.

Saxifraga (§ Isomeria) Rossii. *Oliv.* (*Hook. Ic. Pl.* t. 1258). Hills south of Corean Gate and elsewhere, on almost inaccessible and bare rocks; called by some "Manchurian Ivy."

Deutzia grandiflora, *Bge.* Kwandien mountains. South of Hingjing; sheltered rocky sides of mountains east of Funghwangchung.

Philadelphus coronarius, *L.*, var. tenuifolius. Chienshan.

P. coronarius, *L.*, var. Chienshan. A form intermediate between vars. *α* and *η* of Maximowicz, who has also seen such (Rev. Hyd. As. Orient. p. 42).

Chrysosplenium flagelliferum, *Schmidt.* Kwandien.

C. ——, sp. nov.? East of Funghwangchung. This has the leaf of *sphærospermum*, Max., and inflorescence of *pilosum*, Max.

Adoxa moschatellina, *L.* Fungwhangshan and Funghwangchung.

Ribes petræum, *Wulf.* Yoongdien. A variety with dense racemes.

Crassulaceæ.

Sedum aizoon, *L.* Chienshan.

Umbelliferæ.

Anthriscus nemorosa, *M. B.* Jaoling.

Sanicula rubriflora, *Schmidt.* Kwandien mountains.

Araliaceæ.

Aralia spinosa, *L.* Fungwhangshan. Leaves edible. Spines fall off when the tree grows some height.

CAPRIFOLIACEÆ.

VIBURNUM BUREJAETICUM, *Rgl. & Herd.* Changdien.

V. OPULUS, *L.* Changdien.

LONICERA RUPRECHTIANA, *Rgl.* West of Hingjing.

L. MAACKII, *Rupr.* Jaoling woods. South of Hingjing. Fungwhangshan.

DIERVILLA VERSICOLOR, *S. & Z.* Chienshan. Kwandien mountains. West of Hingjing.

SAMBUCUSRACEMOSA, *L.* Wide valley west of Hingjing; Yoongdien; Chienshan.

RUBIACEÆ.

GALIUM APARINE, *L.* Chienshan.

VALERIANEÆ.

VALERIANA OFFICINALIS, *L.* Jaoling.

COMPOSITÆ.

SENECIO CAMPESTRIS, *L.* Hills south of Corean Gate. Exposed south face of Fungwhangshan. Jaoling.

ATRACTYLIS CHINENSIS, *DC.* South of Hingjing.

CIRSIUM SEGETUM, *Bge.* Jaoling.

HEMISTEPTA LYRATA, *Bge.* Chienshan.

GERBERA ANANDRIA, *Schs. Bip.* Changdien. Exposed south face of Fungwhangshan.

SCORZONERA MACROSPERMA, *Turcz.*, var. foliis augustioribus. Jaoling.

S. AUSTRIACA, *Willd.*, var. Fungwhangshan. Humilis, foliis sublinearibus vaginis intus comosis, pedunculis perbrevibus, involucri bracteis sparsim comosis, capitulis magnis.

S. AUSTRIACA, *Willd.* Jaoling. Fungwhangshan.

ACHYROPHORUS GRANDIFLORUS, *Ledeb.* Chienshan.

TARAXACUM OFFICINALE, *Wigg.* Exposed south face of Fungwhangshan. Jaoling. Pass west of Ngaiyang.

LACTUCA VERSICOLOR, *DC.* West of Sarhoo. Jaoling and elsewhere.

LACTUCA (IXERIS) RAMOSISSIMA (*Gray*). Fields south of Corean Gate; west of Sarhoo; Jaoling.

CAMPANULACEÆ.

CAMPANULA PUNCTATA, *Lamk.* Chienshan.

ERICACEÆ.

RHODODENDRON MICRANTHUM, *Turcz.* Chienshan.

PRIMULACEÆ.

PRIMULA CORTUSOIDES, *L.* Moist valleys east of Funghwang-chung.

ANDROSACE SAXIFRAGIFOLIA, *Bge.* Fungwhangshan.

A. FILIFORMIS, *Retz.* Sarhoo.

LYSIMACHIA BARYSTACHYS, *Bge.* West of Chienshan.

L. CLETHROIDES, *Duby.* Chienshan.

OLEINEÆ.

SYRINGA VULGARIS, *L.* Chienshan, top of mountain (in fruit).

ASCLEPIADEÆ.

VINCETOXICUM SIBIRICUM, *Dne.* East of Monkden. West of Chienshan. South of Hingjing.

GENTIANEÆ.

GENTIANA THUNBERGII, *DC.* Fungwhangshan. Exposed mountain-side, Corean Gate.

CONVOLVULACEÆ.

CALYSTEGIA ACETOSELLIFOLIA, *Turcz.* Sarhoo. Roadsides by cultivated fields throughout Manchuria.

CONVOLVULUS ARVENSIS, *L.* Sarhoo.

BORAGINEÆ.

TRIGONOTIS PEDUNCULARIS, *Bth.* West of Sarhoo.

OMPHALODES SERICEA, *Max.*, var. West of Ngaiyang. South of Hingjing. Foliis radicalibus longius petiolatis, petiolis subglabris.

ECHINOSPERMUM LAPPULA, *Lehm.* East of Fooling.

BRACHYBOTRYS PARIDIFORMIS, *Max., Oliv. in Hook. Ic. Pl.* t. 1254. Chienshan. Kwandien mountains.

SCROPHULARIACEÆ.

MAZUS STACHYDIFOLIUS, *Max.* (*M. villosus*, Hemsl.). Jaoling.

LABIATÆ.

LAMIUM PETIOLATUM, *Royle.* South of Corean Gate.

MARRUBIUM INCISUM, *Bth.* Jaoling. Monkden.

SALVIA PLEBEIA, *R. Br.* Chienshan.

NEPETA GLECHOMA. West of Hingjing and elsewhere.

DRACOCEPHALUM SINENSE, *S. Moore*, sp. nov. (Pl. XVI. fig. 7.) Caule e rhizomate crassiusculo debili appresse pilosulo, foliis longe petiolatis cordatis vel ovato-cordatis crenato-serratis demum puberulis, verticillastris 1–3-floris, pedicellis calyce brevioribus interdum fere obsoletis juxta vel infra medium bracteas duas minimas setaceas gerentibus, calycis patenti-pilosuli lobis lanceolatis acutis tubo multoties brevioribus, tribus posticis in labium posticum coalitis, corolla majuscula calycem plusquam duplo superante; nuculæ ignotæ.

Hab. In montibus prope Kwandien et ad Yoongdien mense Apr. florens.

A near ally of *D. urticifolium*, Miq., which I formerly referred to *Nepeta* (§ *Macronepeta*), but which appears to be a true *Dracocephalum* on account of its bilabiate calyx.

PRUNELLA VULGARIS, *L.* Chienshan.

CHENOPODIACEÆ.

CHENOPODIUM FICIFOLIUM, *Sm.* Monkden.

POLYGONACEÆ.

POLYGONUM FAGOPYRUM, *L.* Chienshan.

P. SIBIRICUM, *Laxm.* West of Chienshan.

RUMEX ACETOSA, *L.* Chienshan.

SANTALACEÆ.

THESIUM CHINENSE, *L.* Jaoling.

LORANTHACEÆ.

VISCUM ALBUM, L. Jaoling. Common; grows chiefly on Willows; berries red or yellow.

Aristolochieæ.

Asarum Sieboldi, *Miq.* Kwandien.

Chloranthaceæ.

Chloranthus japonicus, *Sieb.* Kwandien mountains. East of Funghwangchung.

Euphorbiaceæ.

Euphorbia Esula, *L.* South of Hingjing.

Securinega ramiflora, *Müll. Arg.* Chienshan.

Ulmaceæ.

Hemiptelea Davidii, *Planch.* Fooling

Ulmus campestris, *L.* Kwandien. South of Hingjing.

Celtis sinensis, *Pers.* Chienshan.

Betulaceæ.

Betula exalata, *S. Moore*, sp. nov. (Pl. XVI. figs. 8–10.) Ramulis fertilibus pubescentibus, foliis ovatis acutis obtusisve basi truncatis inæqualiter et argute serratis glabris nervis (et præcipue ad paginam inferiorem nervulis) appresse hirtis exceptis, utrinque 6–8-nerviis, gemmis puberulis, strobilis cylindricis, samaris ad nuculam simplicem reductis.

Hab. In summis collium prope Chienshan (1000 ped. alt.); Jienchang. "Ulmus" Sinensium.

Folia usque ad 4 cm. long. et 3·5 cm. lat., pagina inferiore pallidiore punctis resinosis obscurissime obsita; serraturis apice induratis; petiolo semipollicari hirto. Strobili subsessiles, erecti vel leviter declinati, 1·5–2 cm. longi; squamæ ciliatæ, basi cuneatæ, lobis linearibus lateralibus intermedio duplo brevioribus.

Ob samaras exalatas discedit, nisi fallor, ab omnibus speciebus hucusque cognitis, et forsan in sectione propria ponenda. *B. chinensi*, Max. (Fragmenta p. 47) proxima, sed foliis haud rotundatis squamarum lobis fere subæqualibus atque samara omnino exaltata vix conspecifica.

Salicaceæ.

Salix gracilistyla, *Miq.* Fungwhangshan.

S. babylonica, *L.* Changdien.

Populus tremula, *L.* South of Hingjing.

P. balsamifera, *L.*, var. laurifolia. Corean Gate.

Cupuliferæ.

Corylus Avellana, *L.* Corean Gate.

Quercus MacCormickii, *Carruth.* Chienshan. Our friend Dr. Trimen was kind enough to compare our plant with the type specimen in the British Museum.

Aroideæ.

Arisæma serratum, *Schott.*, var. South of Hingjing. Chienshan.

Irideæ.

Iris ensata, *Thbg.* Fooling.

I. Rossii, *Baker, Gard. Chron.* N. S. vol.viii. p. 809. Changdien.

I. ruthenica, *Ait.* Ngaiyang.

Liliaceæ.

Asparagus davuricus, *Fisch.* Sarhoo. South of Hingjing.

A. officinalis, *L.* Fungwhangshan, Jaoling.

A. schoberioides, *Kth.* Sarhoo.

A. gibbus, *Bge.* Fooling. Jaoling.

Polygonatum vulgare, *Desf.* Hills of Corean Gate. South of Hingjing. Kwandien mountains. The specimen from the latter locality shows tendencies towards *P. japonicum*, Morr. & Dne. if, indeed, that is to be regarded as a distinct species.

P. verticillatum, *All.* Sarhoo.

Convallaria majalis, *L.* South of Hingjing. West of Ngaiyang.

Disporum smilacinum, *A. Gray.* Chienshan.

Tovaria japonica, *Baker.* Chienshan.

T. Rossii, *Baker* (sp. nov.). Caulis 8–9-pollicaris, dimidio inferiore nudo stricto glabro, dimidio superiore foliato flexuoso pubescente. Folia 7 contigua subpetiolata 2½–3 poll. longa, facie glabra, dorso obscure pubescentia, inferiora subrotunda obtusiuscula 2 poll. lata, superiora oblonga subacuta 1 poll. lata. Inflorescentia densa subspicata 7–8 lin. longa, bracteis minutis deltoideis, flori-

bus infimis brevissime pedicellatis, reliquis sessilibus. Perianthium albidum, 1 lin. longum, segmentis oblongo-oblanceolatis obtusis. Genitalia inclusa.

General habit and leaves of *T. japonica*, from which it differs by its subspicate inflorescence.

Hab. Kwandien Mountains.

ALLIUM LINEARE, *L.* Chienshan.

A. THUNBERGII, *Don.* Chienshan.

PARIS OBOVATA, *Ledeb.* Chienshan. Bank of Ngai River. East of Ngaiyang.

GAGEA LUTEA, *Ker.* Woods, moist bank of stream Fungwhangshan.

LLOYDIA TRIFLORA, *Baker.* Kwandien. Narrow mountain gorge east of Funghwangchung.

GRAMINEÆ.

ALOPECURUS GENICULATUS, *L.* West of Sarhoo.

HIEROCHLOA BOREALIS, *H. & S.* Ngaiyang. Hills near Jakushan, and elsewhere.

PANICUM MANDSHURICUM, *Max.* (ex descript.). Chienshan.

AGROSTIS ALBA, *Schrad.* Chienshan.

MELICA SCABROSA, *Trin.* Jaoling.

POA SPHONDYLOIDES, *Trin.* Chienshan. Sarhoo. East of Fooling.

P. PRATENSIS, *L.* Chienshan. Jaoling.

BRACHYPODIUM SYLVATICUM, *R. & S.* Chienshan.

ELYMUS DASYSTACHYUS, *Trin.* Jaoling.

EULALIA DENSA, *Munro.* Fungwhangshan.

ANTHISTIRIA CILIATA, *Retz.* Chienshan.

CYPERACEÆ.

CAREX BREVICULMIS, *Br.* Hills south of Corean Gate.

C. STENOPHYLLA, *Wahl.* Ngaiyang.

C. PEDIFORMIS, *C. A. Mey.* Hills south of Hingjing. Kwandien mountains and elsewhere.

CAREX PISIFORMIS, *Boott.* Chienshan. Hills south of Hingjing.

C. HETEROSTACHYA, *Bge.* Jaoling.

C. JAPONICA, *Thbg.* Chienshan. The form with short spikelets.

C. FALCATA, *Turcz.* Kwandien mountains. Saimaji.

C. DIGITATA, *L.* Narrow mountain-gorges east of Funghwangchung; Corean Gate.

C. CLANDESTINA, *Good.* South side of Fungwhangshan.

C. NOTHA, *Kth.* Kwandien mountains.

CONIFERÆ.

PINUS MASSONIANA, *Lamb.* Jaoling.

SELAGINELLEÆ.

SELAGINELLA INVOLVENS, *Spring.* Shady side of mountains at Fungwhangshan. Common on all eastern mountains.

EQUISETACEÆ.

EQUISETUM ARVENSE, *L.* Chienshan.

FILICES.

ONOCLEA GERMANICA, *Willd.* Chienshan.

O. SENSIBILIS, *L.* Chienshan. Yoongdien.

WOODSIA POLYSTICHOIDES, *Eaton.* Chienshan.

W. MANCHURIENSIS, *Hook.* Chienshan.

DAVALLIA WILFORDII, *Baker.* Chienshan.

ADIANTUM PEDATUM, *L.* Saimaji. Called "Pheasant's Wing" by the natives.

CHEILANTHES ARGENTEA, *Hook.* Rock-crevices south of Corean Gate.

PTERIS AQUILINA, *L.* Chienshan.

ASPLENIUM (ATHYRIUM) FILIX-FŒMINA, *Bernh.* Chienshan.

SCOLOPENDRIUM SIBIRICUM, *Hook.* Fungwhangshan and all mountains in South Manchuria.

ASPIDIUM CRASPEDOSORUM, *Maxim.* Saimaji.

ASPIDIUM TRIPTERON, *Kunze*. Kwandien.

NEPHRODIUM CHINENSE, *Baker*. Fungwhangshan.

N. ERYTHROSORUM, *Hook*. Mountain-gorges east of Funghwangchung.

N. FILIX-MAS, *Rich.*, var. ELONGATUM. Chienshan. West of Hingjing.

POLYPODIUM LINEARE, *Thbg*. Fungwhangshan.

P. LINEARIFOLIUM, *Hook*. Saimaji.

OSMUNDA CINNAMOMEA, *L*. A very small unlocalized scrap.

DESCRIPTION OF PLATE XVI.

Fig. 1. *Anemone Rossii*, S. Moore.
2. —— ——. One of its carpels.
3. *Leontice microrhyncha*, S. Moore.
4. —— ——. Its ovary, magnified.
5. *L. microrhyncha*, var. *venosa*.
6. *Viola hirtipes*, S. Moore.
7. *Dracocephalum sinense*, S. Moore.
8. *Betula exaltata*, S. Moore.
9. Squama from ripe cone of same.
10. Fruit of *B. exaltata*, of natural size.

Enumeration of Australian Lichens in Herb. Robert Brown (Brit. Mus.), with descriptions of new Species. By the Rev. J. M. CROMBIE, F.L.S.

[Read June 19, 1879.]

THIS valuable if not very extensive collection, now deposited in the Herbarium of the British Museum, was made between the years 1802–05, during the voyage of Capt. Flinders to New Holland and Tasmania. No complete catalogue of the lichens then gathered was ever published by Brown, though it is evident from his notes on several of the species which it contains that he had at one time intended to do so. A list, however, of species common to Australia and Europe was given in the Appendix to the narrative of 'Flinders's Voyage to Australia,' vol. ii. (1814), and subsequently transcribed by Mr. Bennett in the 'Miscellaneous Botanical Works of Robert Brown,' vol. i. (1866), pp. 69, 70.

This list, comprehending a few plants such as *Lecidea geographica*, *Lecanora atra*, &c., not present in Herb. Brown, would, in the present state of lichenological science, require considerable revision. The tracts of country in which the following lichens were collected are New South Wales and the adjacent south coast of Australia, the north and south-west district of Tasmania, or Van Diemen's Land. As is unfortunately too often the case, both in the older and more recent collections of exotic lichens, no saxicole species are contained in Herb. R. Brown, though these would have very much added to its value and importance.

Family Ephebacei.

Tribe Ephebei.

1. Ephebe pubescens (*Ach.*).

The plant is apparently referable to our European species, although in the absence of apothecia, and coming from a region so very remote, it cannot with absolute certainty be identified.

On moist rocks, Grose River, sparingly and sterile. Coll. Br. no. 522 *a*, s. n. *Lichen pubescens*.

2. Ephebe tasmanica, *Cromb.*, sp. n. Subsimilis *Ephebæ pubescenti*, sed thallo olivaceo-fusco læviore, simpliciore, spermogoniis pallidis (receptaculo pallido).

Textura sicut in *E. pubescente*, sed apothecia nondum visa. Spermogonia in tuberculis pallidis lateralibus semiglobosis, humido statu subincoloribus, basi latit. 0·11–0·14 millim.; spermatia cylindrica, longit. 0·003–0·004 millim., crassit. circiter 0·0007 millim.

On moist rocks, Grose River, very sparingly. Coll. Br. no. 522 *b*, s. n. *Lichen pubescens*.

Family Collemacei.

Tribe Collemei.

1. Collema implicatum, *Nyl.*

On trees, Derwent River, fertile. Coll. Br. no. 511, s. n. *Lichen fascicularis*.

2. Collema leucocarpum, *Tayl.* (= *C. glaucophthalmum*, Nyl. Syn. p. 114).

On the trunks of trees, Derwent River, Tasmania, and S. coast of New Holland. Coll. Br. no. 549 *b*, s. n. *Lichen obductus*.

3. Collema nigrescens (*Huds.*).

A state with less rugoso-plicatulate thallus, but evidently referable to this species.

On the trunks of trees, Derwent River, fertile. Coll. Br. no. 549 *a*, s. n. *Lichen obductus.*

4. Ramalodium succulentum (*R. Br.*), *Nyl.*, gen. et sp. n. "Thallus olivaceo-nigrescens ramalinoideo-divisus, superficie tenuiter longitudinaliter striatulus, basi pallescens, subdendroideus (altit. circiter 8–9 millim.), ramis teretiusculis inæqualis altitudinis (haud paucis crassit. 0·5–1·2 millim.); apothecia rufescentia biatorina (latit. 0·5–0·8 millim.), in ramis thalli lateralia vel subterminalia, crassiuscule marginata; sporæ 8næ, ellipsoideæ, simplices, longit. 0·010–0·011 millim., crassit. 0·007 millim. Iodo gelatina hymenialis nonnihil cærulescens (thecæ præsertim tinctæ).

"Genus distinctum (quocum textura thalli convenit) apotheciis biatorinis, thecis cylindraceis. Thallus quoad superficiem facie *Stephanophori.* Spermogonia arthrosterigmatibus et spermatiis solitis *Collematum.* Spermatia longit. 0·004 millim., crassit. vix 0·001 millim."—*Nyl. in litt.*

Amongst mosses on trunks of trees, River Grose. Coll. Br. no. 551.

Family Lichenacei.

Tribe Sphærophorei.

1. Sphærophoron coralloides, *Pers.*

On rocks, Table Mt., sterile. Coll. Br. no. 524, s. n. *Lichen globiferus.*

2. Sphærophoron australe.

On semiputrid trunks of trees, Table Mt., sterile. Coll. Br. no. 517, s. n. *Lichen fragilis.*

Tribe Stereocaulei.

1. Stereocaulon ramulosum, *Ach.*

On rocks, Table Mt., and near Grose River, fertile. Coll. Br. no. 526, s. n. *Lichen ramulosus.*

Tribe Cladoniei.

1. Cladonia acuminata (*Ach.*).

On the ground, Table Mt., fertile. Coll. Br. no. 531. s. n. *Cladonia pulverulenta.*

2. Cladonia adspersa, *Flk.*

On the ground amongst mosses, Table Mt., sterile and decorticated. Coll. Br. no. 535, s. n. *Lichen imperforatus.*

3. Cladonia deformis, *Hffm.*

On the ground among rocks, Table Mt., sterile. Coll. Br. no. 530, s. n. *Lichen deformis.*

4. Cladina sylvatica (*Hffm.*).

On the ground, Table Mt., sterile. Coll. Br. no. 527, s. n. *Lichen rangiferinus.*

5. Cladia aggregata (*Sw.*).

On elevated heaths, Australia, fertile. Also in its young and sterile condition. Coll. Br. no. 532, s. n. *Lichen multiflorus.*

6. Cladia retipora (*Ach.*).

On mountain heaths, Australia, and sterile. Coll. Br. no. 533 and no. 534, s. n. *Lichen cribrosus.*

Tribe Roccellei.

1. Roccella montagnei, *Bel.*

On maritime rocks, S. coast of Australia, fertile. Coll. Br. no. 509, s. n. *Roccella* ?

Tribe Siphulei.

1. Siphula torulosa (*Thnb.*).

On the ground, Table Mt., sparingly and sterile. Coll. Br. no. 501, not named.

2. Thamnolia vermicularis (*Sw.*).

On the ground amongst mosses on the sides and the summit of Table Mt., sterile. Coll. Br. no. 528, s. n. *Lichen vermicularis.*

Tribe Ramalinei.

1. Ramulina geniculata, *Tayl.*

On the trunks of trees, near Port Jackson, fertile. Coll. Br. no. 519, s. n. *Lichen fastigiatus.*

Tribe Usneei.

1. Usnea florida (*L.*).

On the branches of trees, River Grose, fertile. Coll. Br. no. 518 *a*, s. n. *Lichen floridus.*

2. USNEA CERATINA, *Ach.*

Along with the preceding (*b*), fertile and sterile.

Tribe ALECTORIEI.

1. NEUROPOGON MELAXANTHUS (*Ach.*).

On rocks, Table Mt., various states, sterile and stunted. Coll. Br. no. 523, s. n. *Lichen ustulatus.*

Tribe PARMELIEI.

1. PARMELIA SUBCAPERATULA, *Nyl.*, sp. n. "Est quasi *P. caperata* minor, thallo deminuto adnato, lobis crenato-incisis (infra etiam summo margine nigris); apotheciis pallido-testaceis aut testaceo-rufis (latit. 1–3 millim.), concavis, margine receptaculari tenui subintegro vel obsolete crenulato; sporæ ellipsoideæ vel oblongo-ellipsoideæ, longit. 0·014–0·017 millim., crassit. 0·007–0·008 millim. Iodo vix nisi thecæ cærulescentes.

"Forsan species propria distincta a *P. caperata* et *P. caperatula*, jam sporis minoribus. Thallus nec K, nec CaCl reagens. Spermatia subbifusiformia, longit. 0·005–0·007 millim., crassit. 0·0005 millim."—*Nyl. in litt.*

On the banks of trees, Derwent River. Coll. Br. no. 539, s. n. Lichen prope *L. caperatum.*

2. PARMELIA TENUIRIMIS, *Tayl.*, *Nyl.*

On rocks, hills near River Derwent, fertile. With large apothecia. Coll. Br. no. 537, s. n. *Lichen amplissimus.*

3. PARMELIA TILIACEA, *Ach.*

On the bark of trees, near Port Jackson. Coll. Br. no. 506, s. n. *Lichen tiliaceus.*

4. PARMELIA LIMBATA, *Laur.*

On rocks, near Port Jackson, fertile. Coll. Br. no. 544, s. n. *Lichen pinnatus.*

5. PARMELIA CONSPERSA (*Ehrb.*).

On rocks, near Port Jackson, fertile. Coll. Br. no. 505. Not named.

Var. *f.* STENOPHYLLA, *Ach.* On rocks along with the following variety, sterile.

Var. MULIPARTITA (*R. Br.*). Thallus smaller, laciniæ narrower,

more divided, suberect; otherwise as in the type. On rocks, near Port Jackson, fertile. Coll Br. no. 542 *a*, s. n. *Lichen multipartitus*. Approaching somewhat to *Parmelia constrictans*, Nyl.

6. Parmelia australiensis, *Cromb.*, sp. n. Thallus albido-flavescens opacus, subtus nigricans nudus, longiuscule laciniatus, laciniis convolutis; apothecia non visa. Accedit facie ad *P. vagantem*, Nyl. Syn. p. 393. Thallus K(CaCl)∓ dilute erythrinose reagens.

On rocks, Table Mt., sterile. Coll. Br. no. 525 *a*, s. n. *Scyphophorus* ?

7. Parmelia lanata (*L.*).

On rocks, Table Mt., sterile. Coll. Br. no. 521, s. n. *Lichen lanatus*.

8. Parmelia lugubris, *Pers.*

On rocks, sides of Table Mt., fertile, with large apothecia. Coll. Br. no. 526, s. n. Lichen affinis *L. physodi*.

9. Parmelia placorhodioides, *Nyl.*

On the trunks of trees, near Port Jackson, fertile. Coll. Br. no. 514 *a*, s. n. *Lichen physodes*.

10. Parmelia mundata, *Nyl.*

On the branches of trees, Derwent River, very sparingly and sterile. Coll. Br. no. 515 *a*, not named.

Var. pulverata, *Nyl.* Laciniæ somewhat broader, densely and minutely greyish-white pulverulent. On the bark of *Dendrosma lucida*, in shady woods, base of Table Mt., sterile. Coll. Br. no. 550, s. n. *Lichen dendrosmæ*.

11. Parmelia pertusa (*Schrank.*).

On the trunks and branches of trees, Tasmania, fertile. Coll. Br. no. 514 *b*, s. n. *Lichen physodes*.

12. Parmelia angustata, *Pers.*

On the bark of trees, near Port Jackson, sparingly and sterile. Coll. Br. no. 515 *b*, not named.

Tribe Stictei.

1. Stictina crocata (*Ach.*).

On mountain-rocks; locality not specified: sterile. Coll. Br. no. 540 *a*, s. n. *Lichen crocatus*.

2. Stictina carpoloma (*Del.*).

On mountain rocks; locality not specified: sterile. Coll. Br. no. 540 *b*, s. n. *Lichen crocatus.*

3. Lobarina scrobiculata (*Scop.*).

On rocks, near Risdon Cove, sterile. Coll. Br. no. 541, s. n. *Lichen scrobiculatus.*

4. Sticta subcaperata, *Nyl.*

On shady rocks, Table Mt., fertile. Coll. Br. no. 555, s. n. *Lichen filix.*

5. Sticta multifida, *Laur.*

On wet mossy rocks, near the cataract of the river Anna Maria, fertile. Coll. Br. no. 516, s. n. *Lichen dichotomus.*

6. Sticta fossulata, *Duf.*

On trunks of trees, near the Derwent River, fertile. Coll. Br. no. 536, s. n. *Lichen linearis.*

7. Sticta Freycineti, *Del.*

On rocks, Table Mt., fertile. Coll. Br. no. 538, s. n. *Lichen latissimus.*

Tribe Peltigerei.

1. Nephromium cellulosum (*Ach.*).

On moist shady rocks, about the cataract of the river Anna Maria. Coll. Br. no. 543, s. n. *Lichen antarcticus.*

2. Peltigera canina, f. membranacea, *Ach.*

Amongst mosses on heaths, base of Table Mt., and near Derwent River. Coll. Br. no. 510, not named.

Tribe Physciei.

1. Physcia chrysophthalma (*L.*).

On branches of trees, Kent's Islands. Coll. Br. no. 545, s. n. *Lichen chrysophthalmus.*

2. Physcia subexilis, *Nyl.*, sp. n. "Similis *Physciæ exili*, Mich., sed thallo toto aurantiaco-flavo et sporis nonnihil minoribus (longit. 0·011–0·015 millim., crassit. 0·006–0·008 millim.). Apothecia croceo-aurantiaca (latit. 1–2 millim.), margine thallino demum excluso."—*Nyl. in litt.*

On rocks, Kent's Islands. Coll. Br. no. 545 *b*, s. n. *Lichen chrysophthalmus* denudatus.

3. PHYSCIA PICTA (*Sw.*).

On the smooth bark of trees, near Kingstown, fertile. Coll. Br. no. 546, s. n. *Lichen pictus.*

Tribe UMBILICARIEI.

1. GYROPHORA CYLINDRICA, *DC.*

On rocks, summit of Table Mt., very sparingly fertile. Coll. Br. no. 558, s. n. *Lichen proboscideus*, Huds.

2. GYROPHORA PROBOSCIDEA, *Ach.*

On granite rocks, summit of Table Mt., sterile. Coll. Br. no. 559, s. n. *Lichen deustus.*

Tribe LECANOREI.

1. PANNARIA RUBIGINOSA (*Thnb.*).

On the trunks of trees, south coast of New Holland. Coll. Br. no. 555, not named.

2. PANNARIA RUBIGINASCENS, *Nyl.*, sp. n. "Subsimilis *Panariæ rubiginosæ*, sed apotheciis biatorinis et sporis minoribus (longit. 0·009–0·012 millim.).

"Thallus divisionibus facile marginibus crispis obscure granuloso-divisis vel microphyllinis. Apothecia obscure rufa (latit. circiter 1 millim.), subimmarginata sæpe convexula."—*Nyl. in litt.*

On decayed trunks of trees, near Derwent river. Coll. Br. no. 512, s. n. *Lichen granularis* (nomen ineptum).

3. PANNARIA NIGRO-CINCTA (*Mnt.*).

On the ground, summit of Table Mt. Coll. Br. no. 508, s. n. *Lichen alpicolus.*

4. CHONDROPSIS SEMIVIRIDIS (*F. Müll.*), *Nyl.* "Thallus pallido-glaucescens vel pallido-virescens linearis et dichotome lineari-divisus, planus, lævis, rigescens, divisionibus divergentibus (latit. circa 2–4 millim.), invicem sinubus sat rotundatis separatis, apicibus vulgo retusis (dichotomia nova incipiente), subtus ochroleucus vel albo-flavescens glaber (obsolete rugulosus); apothecia fusca prominula sparsa, margine thallino integro cincta."—*Nyl. Syn.* tom. ii. p. 57, obs.

On rocks, Table Mt., sterile. Coll. Br. no. 525 *b*, s. n. *Scyphophorus?*

Nylander (*l. c.*) observes that the systematic place of this peculiar plant is very doubtful, on account of only young apothecia being present and no spermogones being visible in the specimen seen by him from the Murray River, Australia, s. n. *Parmelia semiviridis*, Müll.

5. PSOROMA HYPNORUM (*Hffm.*).

On the sides of rocks, Table Mt. A very fragmentary specimen with only three apothecia present; but it seems quite identical with the European plant. Coll. Br. no. 554, s. n. *Lichen hypnorum*.

6. PSOROMA SPHINCTRINUM (*Mnt.*).

On trunks and branches of trees, Derwent River: fertile. Coll. Br. no. 533 *a*, s. n. *Lichen dendrosmæ* similis.

Var. LEPROLEMA, *Nyl.*, *L. Campbell*, p. 3.

Along with the preceding (*b*), fertile.

7. PSOROMA ASPERELLUM (*Hmp.*), *Nyl.* "Thallus squamulis albido-pallescentibus minutis constans crenatis subdispersis (vel passim imbricatis); apothecia pallido-rufescentia (latit. circa 1 millim.), margine thallino fere crenato (vel subintegro) cincta; sporæ longit. 0·012–0·016 millim., crassit. 0·008–0·009 millim. Gelatina hymenia iodo vinose fulvo-rubescens (præcedente cærulescentia lævi)."—*Nyl. Syn.* t. ii. p. 24.

On the bark of trees, sides of Table Mt. Coll. Br. no. 547, s. n. *Lichen ascendens*. Recorded also from the Cape of Good Hope.

8. PSOROMA SOCCATUM (*R. Br.*), sp. n. Thallus pallidus vel subflavido-albidus (K—), squamulosus, squamulis adnatis varie lobulatis (latit. circiter 0·5 millim.), sæpe in granula sorediosa dissolutis, hypothallus niger; apothecia testaceo-rufa (latit. circiter 1 millim.), margine thallino crenato cincta; sporæ longit. 0·015–0·017 millim., crassit. 0·010–0·011 millim. Iodo gelatina hymenialis cærulescens, deinde vinose violaceo-rubens (thecæ præsertim tinctæ).

This is an easily distinguished species, with the squamules more or less scattered or subimbricate on a black continuous hypo-

thallus. The spores sometimes have the wall produced at either apex, which is somewhat acute.

On dead trunks of trees, base of Table Mt. Coll. Br. no. 502, s. n. *Lichen soccatus.*

9. LECANORA FERRUGINEA (*Huds.*).

On the bark of trees, Derwent River. Coll. Br. no. 503, not named. In one specimen the apothecia are for the most part crenulated at the margins, = f. *crenularia* (With.).

10. LECANORA PUNICEA, *Ach.*

On the bark of trees, Middle Harbour and at Port Jackson. Coll. Br. no. 507 and no. 569, s. n. *Lichen guttatus.*

Tribe THELOTREMEI.

1. THELOTREMA LEPADINUM, *Ach.*

On the smooth bark of trees, banks of Grose River. Coll. Br. no. 520, s. n. *Lichen ? occultatus.*

2. URCEOLARIA SUBOCELLATA, *Nyl.*, sp. n. "Similis *Urceolariæ ocellatæ* (Vill.), sed thallo (albido) K lurido-fuscescente et dein ochraceo-colorato. Sporæ longit. 0·020–0·024 millim., crassit. 0·007–0·011 millim. Thallus facile etiam reactione alkalina accidentali quoque in natura ochraceus invenitur. Forsan sola subspecies Europææ *U. ocellatæ.*"—*Nyl. in litt.*

On the ground, near Risdon Cove. Coll. Br. no. 563, s. n. *Lichen lateritius.*

Tribe LECIDEEI.

1. CŒNOGONIUM IMPLEXUM, *Nyl.*

On the smooth bark of trees in shady woods, base of Table Mt. Coll. Br. no. 504, s. n. *Lichen spongiosus.*

2. LECIDEA LUTEA (*Dcks.*).

On the bark of trees, near Derwent River. Coll. Br. no. 529, s. n. *Lichen nudus.*

3. LECIDEA PARVIFOLIA (*Pers.*), *Nyl.*

On the smooth bark of trees, Grose River. Coll. Br. no. 552, s. n. *Lichen parvifolius.*

The apothecia are usually white-pubescent around the base.

4. Lecidea Flindersii, *Cromb.*, sp. n. Subsimilis *Lecideæ decoloranti* (cujus fere sit varietas thallo gilvo-luteo tenui subleproso, apotheciis luteo-rufescentibus, margine gilvo-luteo, inde quasi lecanoroideo). Paraphyses graciles. Sporæ ellipsoideæ simplices, longit. 0·011–0·014 millim., crassit. 0·005–0·006 millim. Iodo gelatina hymenialis dilute cærulescens (thecæ præsertim tinctæ).

Facies est *Lecanoræ* affinis *Lecanoræ sarcopsi.*

On the ground, Risdon Cove. Coll. Br. no. 565, not named.

5. Lecidea immarginata (*R. Br.*), sp. n. Thallus glaucescens tenuis rimulosus, ambitu subleprosus; apothecia carneo-rufella convexa (latit. 0·5–0·9 millim.), intus incoloria; sporæ 8næ, ellipsoideæ simplices, longit. 0·012–0·016 millim., crassit. 0·007 millim., paraphyses mediocres, epithecium et hypothecium incoloria. Iodo gelatina hymenia cærulescens, deinde thecæ luteo-violascentes.

Comparari possit cum *L. anteposita*, Nyl., Lich. Port Natal, p. 8, sed ab ea mox differt apotheciis immarginatis convexis.

Amongst mosses on the bark of trees, banks of Grose River. Coll. Br. no. 591, s. n. *Lichen immarginatus.*

6. Lecidea septosior, *Nyl.*, sp. n. "Thallus glaucescens tenuissimus vel evanescens; apothecia nigra prominula, crasse marginata, demum margine (obsolete cæsio-pruinoso) explanato, mediocria (latit. 0·5–0·7 millim.), intus obscure rufescentia; sporæ 8næ, aciculares subrectæ 19–31-septatæ, longit. 0·060–0·082 millim., crassit. circiter 0·004 millim., epithecium nigrescens, hypothecium dilute luteo-rufescens. Iodo gelatina hymenialis cærulescens.

"Affinis est *L. endoleucæ*, a qua notis datis (apotheciis intus obscuris, &c.) facile distinguenda. K nec epithecium nec hypothecium reagenda."—*Nyl. in litt.*

On the bark of trees, near Port Jackson. Coll. Br. no. 562, not named.

7. Lecidea versicolor, *Fée.*

On the bark of trees, Grose River. Coll. Br. no. 548, s. n. *Lichen atro-cinereus.*

8. Lecidea decipiens (*Ehrh.*).

On the ground, Risdon Cove, sparingly fertile. Coll. Br. no. 567, s. n. *Lichen decipiens.*

9. Lecidea crystallifera, *Tayl.*, *Nyl.*

On rocks thinly covered with earth, Risdon Cove. Coll. Br. no. 564, s. n. *Lichen tessulatus.*

10. Lecidea disciformis (*Fr.*), *Nyl.*

On the trunks of trees, Port Jackson. Coll. Br. no. 557, s. n. *Lichen sordidus.*

Spores 0·018–0·021 millim. long, 0·008–0·011 millim. thick.

11. Lecidea Parmeliarum (*Sommrf.*).

Parasitic on the thallus of *Parmelia conspersa*, near Port Jackson. Coll. Br. no. 505.

Tribe Graphidiei.

1. Graphis sophistica, *Nyl.*

On the bark of trees, near Port Jackson. Coll. Br. no. 560, s. n. *Opegrapha plebeja.*

2. Graphis intricata, *Fée.*

On the bark of trees, Grose River. Coll. Br. no. 561, s. n. *Opegrapha dendritica.*

3. Melaspilea circumserpens, *Nyl.*, sp. n. "Thallus vix ullus visibilis; apothecia nigra cylindraceo-linearia radiato-conferta (latit. circiter 0·2 millim., longit. 2–3 millim.), supra epithecio anguste rimiformi, intus sectione medio late alba; sporæ 8næ, incolores fusiformes 1-septatæ, longit. circiter 0·018 millim., crassit. 0·006 millim., paraphyses gracilescentes vix regulares. Iodo gelatina hymenialis non tincta.

"Species omnino peculiaris apotheciis radiato-confertis centro confluentibus."—*Nyl. in litt.*

On the bare ground, rarely on stones, hills near Risdon Cove. Coll. Br. no. 566, s. n. *Lichen ambiguus.*

Tribe Pyrenocarpei.

1. Trypethelium cruentum, *Mnt.*

On the bark of trees, near Port Jackson. Coll. Br. no. 568, not named.

On *Helvella californica*. By William Phillips, F.L.S.

[Abstract of Paper read June 5, 1879.]

Helvella californica is the name of a new species of fungus described by the above author, and an account of which, with a plate, will be issued in the next Part of the Society's 'Transactions.' Its nearest ally is *H. crispa*, Fr., from which it differs in the colour of the hymenium and the stem, and in being a larger species. Science is indebted to Dr. Harkness, of San Francisco, for the collection of this new species, along with other forms of fungi, gathered in 1876 in the Sierra Nevada Mountains, California.

Ferns of North India. By C. B. Clarke, F.L.S.

[Abstract of Paper read June 19, 1879.]

The memoir, of which the following is but an epitomized sketch, will subsequently appear in full in the Society's 'Transactions.' It comprises descriptions, in English, with synonyms, of the 380 ferns of Northern India, with notices of the more important varieties, and is illustrated by 30 plates of the new species and critical forms. It is drawn up in the form of an elaborate appendix to the 'Synopsis Filicum' of Hooker and Baker; and therefore, unless there is something to add, the account in the Synopsis is not copied.

Under "Ferns" is included all the genera of the Synopsis; there is also added a description of the 12 Lycopodiums and 4 Equisetums of North India.

Under North India is included all British India, from Chittagong westwards and northwards, excluding, therefore, the Deccan peninsula, illustrated by Beddome in his 'Ferns of Southern India.'

The mountains of North India, from Kashmir to Bhotan and Chittagong, form one large botanic province; the whole of the Deccan, from Gwalior and Chota Nagpore to Ceylon, forms another. The Deccan is the remnant of the ancient southern continent, compared with which the Himalaya is a thing of yesterday. The two regions, distinct alike geologically and botanically, are separated by the plain of the Ganges and Punjab,

which, perhaps from its long cultivation, has no well-distinct flora of its own.

The Ferns of Southern India have been illustrated completely by Colonel Beddome, who knows them thoroughly in the field; and it will not be easy to add very much to his account. Colonel Beddome has also, in his 'Ferns of British India,' illustrated the Ferns of North India; but he has collected very little in North India, and his work has been founded on material, often scanty, forwarded to him. The scope of the present paper is therefore confined to North India.

The material compared comprises:—1st, the Kew collection; 2nd, my own collection, which, so far as North India is concerned, is rather more complete than the Kew collection; 3rd, the Wallichian Herbarium: a complete reduction of this, so far as the North-Indian ferns are concerned, is appended to the paper.

The whole of the descriptions have been written in the Kew Herbarium, with the privilege of consulting Mr. Baker on every point as it arose. After each large tribe was written out, Major F. Henderson, F.L.S., came to Kew and went through the whole material (except Wallich's type collection) with the MS. The present paper would therefore be better entitled by Clarke and Henderson; the very few and trifling points on which we have not agreed are specially mentioned in the paper as they occur.

The paper contains no striking changes nor any new genera. The new species described are but 17 out of 380. The paper is made up mainly of minute corrections, and attempts to define the species more closely in words. The most important features in the paper are the rehabilitation of many old species of Wallich, and the removal of several imperfectly known species from the positions assigned them by Mr. Baker to new genera or sub-genera. Thus

Alsophila Brunoniana, *Wallich*,	becomes	**Hemitelia Brunoniana.**
Aspidium fæniculaceum, *Hook.*,	„	**Diacalpe fæniculacea.**
Polypodium dareæforme, *Hook.*,	„	**Davallia dareæformis.**
Davallia repens, *Baker*,	„	**Lindsaya repens.**
Diplasium longifolium, *Baker*,	„	**Euasplenium longifolium.**
Aspidium sikkimense, *Baker*,	„	**Lastrea sikkimensis.**
Goniophlebium erythrocarpon, *Baker*,	„	**Pleopeltis erythrocarpa.**

These alterations, it is hoped, are not likely to be disputed by those who can inspect the new material.

Attempt is made to fix more fully, and therefore more accurately, the habitats. In the 'Synopsis' Baker usually gives "North India" or "Himalaya" only. The moist climate of East Bengal nourishes a large number of ferns in the plains. Of the ferns collected rarely, as full habitats are given as can be got from the tickets.

The confusion that has arisen from the quotations of Wallich's numbers is very great, and very difficult now to set straight. The general rule is that the large-paper type, with the lithographed name of Wallich on it marked A in the Wallichian Herbarium, is to govern the name of the fern, and that the B, C ... and small-paper sheets of Wallich's collection, distributed under the same name, are, when they differ from the large-paper A (as is very frequently the case), of no authority. But even this plain rule cannot be always acted up to; the whole of the duplicate sheets of Wall. Cat. 361, *Aspidium fuscipes*, Wall., are the fern known (and figured by Beddome) as *fuscipes*; but Wallich's own large-paper A 361 is *Nephrodium sagenoides*, Baker. As Mr. Moore has already pointed out, the fern described by Sir W. J. Hooker as *Asplenium Finlaysonianum*, Wall. Cat. 191, is indeed the fern of the duplicate sheets of Wall. Cat. 191; but the whole of the large-paper Wall. Cat. 191 is *Asplenium macrophyllum*, while Wallich's own name for *A. Finlaysonianum* was *A. Hookerianum*, Wall. Cat. 2682. Such mistakes are difficult to remove entirely from the pages of botanic history in the case of very common and well-known species, as are the two quoted; still more difficult to deal with are errors regarding critical or little-known species.

It has not been thought judicious in a paper of this nature to attempt any radical changes in the genera &c. of ferns, though a good deal of matter bearing thereon has been collected. The species are marshalled as in Hk. & Baker's 'Synopsis,' the leading principle adopted being to make as few changes as possible.

A Synopsis of Colchicaceæ and the Aberrant Tribes of Liliaceæ. By J. G. Baker, F.R.S., F.L.S.

[Read February 16, 1879.]

Introduction.—The present paper is the sixth of a series in which I have attempted to monograph the genera and species of the great natural order Liliaceæ. As has been explained in a previous paper, it is most naturally separated into three main divisions or suborders:—1st. *Liliaceæ veræ*, marked by a loculicidal capsule, an undivided style, and introrse anthers; 2nd. *Colchicaceæ*, marked by a septicidal capsule, a tripartite style, and extrorse anthers; and 3rd. *Asparagaceæ*, characterized by its baccate fruit. Outside these stand three aberrant tribes, Conanthereæ, Liriopeæ, and Gilliesieæ, which those who are inclined to multiply the number of natural orders might plausibly regard as distinct orders. In the rotation in which my papers have succeeded one another, I have followed working convenience, and not strict botanical sequence founded upon affinity. The present paper includes the whole of Colchicaceæ and the genera and species of the three aberrant tribes just named, and, in addition, three small tribes of Liliaceæ veræ which are almost peculiar to Australia, and which I treat now so as to leave only two well-marked groups to be dealt with on a future occasion:—first, the suffruticose Liliaceæ (*Yucca* and *Dasylirion* with the Aloineæ); and, secondly, the tribe Allieæ, which only includes *Gagea* and *Nothoscordum* in addition to its large type genus.

The suborder Colchicaceæ includes 39 genera and 153 species. Of the three suborders of Liliaceæ, it includes by far the greater number of genera which deviate from the subordinal characteristics. In a large number of the genera the dehiscence of the anther is by no means definitely extrorse. In Uvularieæ, the tribe of Colchicaceæ which includes the largest number of genera, the styles are more or less combined. In Anguillarieæ, Helonieæ, Tofieldieæ, and some of the genera of Uvularieæ the dehiscence of the capsule is loculicidal. Altogether 24 out of 39 genera deviate more or less from the ideal Colchicaceous type in the direction of Liliaceæ veræ; so that it seems utterly hopeless to attempt to keep up Colchicaceæ or Melanthiaceæ as a distinct natural order, as has often been proposed. Out of the seven tribes here adopted, Colchiceæ, Merendereæ, and Veratreæ are the only three

in which all the characters just stated as characteristic of the suborder are found combined. The other four tribes, Anguillarieæ, Uvularieæ, Helonieæ, and Tofieldieæ deviate from it more or less decidedly.

Another point to be noticed is that amongst the genera placed under Colchicaceæ we find by far the greater number of those regarded as Liliaceæ which recede conspicuously from the ideal Liliaceous type, or connect Liliaceæ with other natural orders. The principal Colchicaceous genera that fall under this head are the following, viz.:—

Weldenia. Segments of the perianth three instead of six.

Hewardia. Stamens three, and leaves equitant and distichous. An excellent connecting link between Liliaceæ and Iridaceæ.

Milligania, by its inflorescence, habit, and pilose leaves and flowers much resembles *Astelia.*

Chionographis. Three perianth-segments suppressed, and filaments nearly or almost suppressed.

Stenanthium and *Anticlea.* Perianth at the base adnate to the ovary.

Pleea. Leaves distichous. Stamens 9–12. Seeds tailed at the tip.

Triantha. Leaves distichous. Seeds tailed at both ends, as in *Narthecium* and *Juncus.*

Tofieldia. Leaves as in the two last, but the seeds not tailed.

Petrosavia. A true parasitic Saprophyte, with all the leaves rudimentary and scariose, and an apocarpous trimerous pistil.

Scoliopus. Ovary unilocular, with three parietal placentas.

A certain number of the Cape and Australian genera, as *Wurmbea*, *Anguillaria*, *Dipidax*, and *Burchardia*, by the firm texture and persistent duration of their flower-wrappers, recede from the Liliaceous type in the direction of Juncaceæ. A large number of the Veratreæ and Helonieæ are decidedly polygamous—a character almost unknown in Liliaceæ veræ, but found in several genera of Asparagaceæ. The curious unilocular reniform anther of the Veratreæ is unique in the natural order. In Liliaceæ veræ there are many large and few monotypic genera; and they fall readily into natural tribes. In Colchicaceæ none of the genera are large, and many contain only one or two species; and, with

the exception of Veratreæ and Helonieæ, the tribes are not satisfactory. We have in the suborder both the gamophyllous and polyphyllous types of perianth copiously represented, and both the bulbous and non-bulbous types of rootstock. About the geographical distribution of the suborder there is nothing peculiar; it simply follows the general plan of Liliaceæ, taking the order as a whole, Colchicaceæ, broadly speaking, being found in all the floras into which the order enters.

Next, as to the aberrant tribes. Conantheræ, with six genera and eleven species, is obviously a link of connexion between Liliaceæ and Amaryllideæ. In all the genera except *Tecophilæa* the ovary simply adheres to the perianth towards its base, as in *Stenanthium* and *Anticlea.* The anthers always dehisce by terminal pores; but we have this occurring in the suborder Asparagaceæ in *Dianella.* Four of the genera are South-American and two South-African. The habit of all, except *Walleria*, is Anthericoid.

Liriopeæ and Gilliesieæ are both very interesting structurally. Both are small tribes, sharply limited geographically, which exhibit in their extreme genera a very striking departure from the Liliaceous type and contain other genera in which the interval is gradually bridged over. In Liriopeæ we have fourteen species under three genera. In all the three the fruit and seeds are precisely alike, the latter rupturing the pericarp in an early stage, and growing afterwards to a large size and berry-like appearance. In its perianth and stamens, *Liriope* itself does not in any way recede from the typical Liliaceous type; *Fluggea* simply differs from it by the ovary being adnate at the base to the perianth; whilst the extreme genus *Peliosanthes* shows a partially inferior ovary and a corona apparently homologous with that of *Narcissus*, inside which the anthers are placed. In Gilliesieæ, where we have seven genera almost restricted to Chili, of which five are monotypic, *Gilliesia* and *Miersia* represent the extreme difference, and the other five the bridge which connects it with typical Liliaceæ.

SYNOPSIS TRIBUUM ET GENERUM.

Subordo I. LILIACEÆ VERÆ. Antheræ introrsæ. Styli simplices. Fructus capsularis loculicido-trivalvis.

Tribus I. BORYEÆ. Perianthium gamophyllum. Herbæ haud bulbosæ, floribus dense capitulatis, singulis bracteis 2 glumaceis perianthii tubo æquilongis stipatis. *Australienses.*

1. BORYA. Stamina 6 libera. Herbæ humiles suffruticosæ, pedunculis simplicibus nudis brevibus.

2. ARNOCRINUM. Stamina 3 connata. Herbæ juncoideæ, caulibus ramosis elongatis.

Tribus II. SOWERBÆEÆ. Perianthium firmulum 6-partitum. Herbæ haud bulbosæ, floribus umbellatis, bracteis minutis. *Australienses.*

3. SOWERBÆA. Stamina perfecta 3. Acaulis, foliis rosulatis.

4. ALANIA. Stamina perfecta 6. Caulis foliatus.

Tribus III. APHYLLANTHEÆ. Perianthium membranaceum 6-partitum. Herbæ rigidæ rhizomatosæ, floribus capitatis, bracteis magnis glumaceis persistentibus stipatis.

* *Triandri.*

5. JOHNSONIA. Capituli bracteæ omnes glumaceæ. *Australia occidentalis.*

6. STAWELLIA. Capituli bracteæ multæ exteriores subulatæ foliis conformes. *Australia occidentalis.*

** *Hexandri.*

7. LAXMANNIA. Folia producta multa subulata. Perianthii segmenta biformia. *Australia.*

8. APHYLLANTHES. Folia omnia vaginiformia. Perianthii segmenta conformia. *Regio Mediterranea occidentalis.*

Subordo II. COLCHICACEÆ. Antheræ sæpissime extrorsæ. Styli sæpissime liberi. Fructus capsularis sæpissime septicido-trivalvis.

Tribus I. COLCHICEÆ. Herbæ bulbosæ. Perianthium gamophyllum. Antheræ biloculares lineares vel oblongæ extrorsum

vel margine dehiscentes. Styli liberi. Capsula septicido-trivalvis.

9. COLCHICUM. Acaulis, floribus radicalibus, perianthio corollino. *Europa, Africa borealis, Asia occidentalis.*

10. WURMBEA. Caulescens, floribus spicatis, perianthio firmulo. *C. B. Spei, Africa tropicalis, Australia occidentalis.*

Tribus II. MERENDEREÆ. Herbæ sæpissime bulbosæ. Perianthium 6-partitum. Antheræ biloculares lineari-oblongæ extrorsæ. Styli liberi. Capsula septicido-trivalvis.

* *Acaules, perianthio corollino, segmentis longe unguiculatis.*

11. MERENDERA. Perianthii lamina segmentorum subplana. *Europa, Oriens, Caucasus, Abyssinia.*

12. ANDROCYMBIUM. Perianthii lamina segmentorum basi cucullata. *C. B. Spei, Africa trop., regio medit.*

** *Caulescentes, perianthio firmulo, segmentis haud vel breviter unguiculatis.*

13. BÆOMETRA. Perianthii segmenta distincte unguiculata. Stamina perigyna. Flores spicati vel solitarii. Bulbosa. *C. B. Spei.*

14. DIPIDAX. Perianthii segmenta obscure unguiculata. Stamina perigyna. Flores spicati. Bulbosa. *C. B. Spei.*

15. BURCHARDIA. Perianthii segmenta vix unguiculata. Stamina hypogyna. Ebulbosa. Flores umbellati. *Australia.*

Tribus III. ANGUILLARIEÆ. Herbæ bulbosæ. Perianthium 6-partitum. Antheræ biloculares oblongæ extrorsæ. Styli liberi. Capsula loculicido-trivalvis.

16. ORNITHOGLOSSUM. Perianthii segmenta distincte unguiculata, flore expanso reflexa. Styli elongati. *C. B. Spei, Madagascaria.*

17. IPHIGENIA. Perianthii segmenta vix unguiculata flore expanso patula. Styli breves. Flores corymbosi vel solitarii. *Regiones calid. veteris orbis.*

18. ANGUILLARIA. Perianthii segmenta vix unguiculata, flore expanso patula. Styli breves. Flores spicati, raro solitarii. *Australia.*

Tribus IV. UVULARIEÆ. Herbæ raro bulbosæ. Perianthium gamophyllum vel 6-partitum. Antheræ biloculares, lineares vel oblongæ, extrorsæ. Styli plus minusve coaliti. Capsula septicido- vel loculicido-trivalvis.

* *Perianthium gamophyllum.*

19. Sandersonia. Perianthium urceolatum, segmentis deltoideis vel lanceolatis. Caulis foliatus, foliis latis acuminatis. *C. B. Spei, Angola.*

20. Leucocrinum. Perianthium hypocrateriforme, segmentis 6. Subacaulis, foliis linearibus. *Amer. bor.*

21. Weldenia. Perianthium hypocrateriforme, segmentis 3. Subacaulis, foliis lanceolatis. *Mexico.*

22. Milligania. Perianthium campanulatum pilosum. Folia radicalia rosulata, caulina pauca reducta. *Tasmania.*

** *Perianthium 6-partitum.*

† *Acaulis, bulbosa.*

23. Bulbocodium. Genus solum. *Europa.*

†† *Scandentes, tuberosæ, foliis omnibus caulinis.*

24. Gloriosa. Stylus basi diffractus. Perianthii segmenta reflexa. *Reg. calid. veteris orbis.*

25. Littonia. Stylus erectus. Perianthii segmenta diu ascendentia. *C. B. Spei.*

††† *Caulescentes, haud bulbosæ nec tuberosæ.*

26. Heloniopsis. Stamina 6. Folia radicalia rosulata multifaria, caulina pauca reducta. *Japonia, China.*

27. Hewardia. Stamina 3. Folia radicalia plura disticha, caulina pauca valde reducta. *Tasmania.*

28. Uvularia. Antheræ lineares basifixæ apiculatæ, filamentis brevissimis. Capsula lata. Folia omnia caulina. *Amer. bor. orientalis.*

29. Tricyrtis. Antheræ parvæ oblongæ versatiles, filamentis elongatis. Capsula angusta. Folia omnia caulina. *Japonia, China, Himalaya orientalis.*

30. Kreysigia. Perianthii segmenta basi haud foveolata, margine glandulosa. Fructus subbaccatus. Folia omnia caulina. *Australia orientalis.*

31. Schelhammera. Perianthii segmenta basi foveolata, margine nuda. Fructus subbaccatus. Folia omnia caulina. *Australia orientalis.*

Tribus V. Helonieæ. Herbæ haud bulbosæ. Perianthium 6-

partitum. Antheræ minutæ globosæ biloculares extrorsæ. Styli liberi. Capsula loculicido-trivalvis.

* *Folia dura angusta. Flores bracteati.*

32. XEROPHYLLUM. Genus solum. *Amer. bor.*

** *Folia oblanceolata subpetiolata. Flores ebracteati.*

33. HELONIAS. Flores hermaphroditi racemosi, perianthii segmentis 6 productis. Filamenta elongata. *Amer. bor. orient.*

34. CHAMÆLIRIUM. Flores dioici racemosi, perianthii segmentis 6 productis. Filamenta elongata. *Amer. bor. orient.*

35. CHIONOGRAPHIS. Flores hermaphroditi spicati, perianthii segmentis 3 (raro 2 vel 4) productis. Filamenta brevissima vel subnulla. *Japonia.*

Tribus VI. VERATREÆ. Herbæ bulbosæ vel rhizomatosæ. Perianthium 6-partitum, raro tubo brevi ovario adnato. Antheræ minutæ reniformes demum uniloculares extrorsæ. Styli liberi. Capsula septicido-trivalvis.

* *Perianthium liberum 6-partitum.*

† *Flores polygami, multi haud fructiferi.*

36. VERATRUM. Flores paniculati. Perianthii segmenta neque unguiculata nec foveolata. Caulis foliatus, foliis sæpissime latis plicatis. *Regio temperata borealis.*

37. MELANTHIUM. Flores paniculati. Perianthii segmenta unguiculata et foveolata. Caulis foliatus. *Amer. bor. orientalis.*

38. SCHŒNOCAULON. Flores subspicati. Caulis nudus. *Amer. bor. orient., Mexico.*

†† *Flores hermaphroditi.*

39. AMIANTHIUM. Perianthii segmenta basi neque unguiculata nec foveolata. Flores racemosi. *Amer. bor. orient.*

40. ZYGADENUS. Perianthii segmenta basi unguiculata et foveolata. Flores sæpissime paniculati. *Amer. bor.*

** *Perianthium basi ovario adnatum.*

41. ANTICLEA. Perianthii segmenta lata basi foveolata. *Amer. bor.*

42. STENANTHIUM. Perianthii segmenta linearia basi haud foveolata. *Amer. bor., Asia borealis, Mexico.*

Tribus VII. TOFIELDIEÆ. Herbæ cæspitosæ, foliis distichis,

angustis. Perianthium firmulum persistens 6-partitum. Antheræ biloculares, introrsum vel margine dehiscentes. Styli liberi. Capsula septicido-trivalvis.

43. TOFIELDIA. Stamina 6. Semina ecaudata. *Regiones boreales frigidiores.*

44. TRIANTHA. Stamina 6. Semina utrinque caudata. *Amer. bor., Japonia.*

45. PLEEA. Stamina 9–12. Semina apice setaceo-caudata. *Amer. bor. orient.*

Genera anomala Colchicacearum.

46. PETROSAVIA. Herba parasitica, foliis omnibus rudimentariis scariosis, carpellis 3 liberis. *Borneo.*

47. SCOLIOPUS. Ovarium uniloculare, placentis tribus parietalibus. *Amer. bor. occidentalis.*

TRIBUS ABERRANTES LILIACEARUM.

Tribus I. CONANTHEREÆ. Herbæ bulbosæ, perianthio basi ovario adnato, antheris poris apicalibus dehiscentibus.

* *Chilenses et Peruvianæ.*

48. CONANTHERA. Perianthium ad ovarium 6-partitum. Stamina 6, antheris elongatis in conum dispositis. Staminodia nulla.

49. CUMINGIA. Perianthium hypocrateriforme, tubo supra ovarium producto. Stamina 6, antheris linearibus. Staminodia nulla.

50. ZEPHYRA. Perianthium hypocrateriforme, tubo supra ovarium producto. Staminodia 2, cum staminibus fertilibus alterna. Antheræ oblongæ.

51. TECOPHILÆA. Perianthium hypocrateriforme, tubo supra ovarium producto. Stamina 3 anteriora fertilia, antheris oblongis; 3 posteriora sterilia.

** *Africanæ.*

52. CYANELLA. Perianthium ringens, staminibus curvatis inæqualibus. Folia multa radicalia rosulata, caulina pauca reducta. *C. B. Spei.*

53. WALLERIA. Perianthium regulare, antheris in conum contiguis. Folia omnia caulina. *Africa tropicalis australis.*

Tribus II. LIRIOPEÆ. Herbæ acaules rhizomatosæ, perianthio regulari, basi sæpissime ovario adnato, pericarpio cito rupto, seminibus drupiformibus in luce maturescentibus.

54. Liriope. Ovarium liberum. Corona nulla. Filamenta antheris æquilonga. *Asia orientalis.*

55. Fluggea. Ovarium basi perianthio adnatum. Corona nulla. Filamenta brevissima. *Asia orientalis, Himalaya.*

56. Peliosanthes. Ovarium basi perianthio adnatum. Perianthium fauce coronatum, antheris intra coronam inclusis. *Asia tropicalis et subtropicalis.*

Tribus III. Gilliesieæ. Perianthium viridulum liberum, staminibus plus minusve irregularibus, paucis vel multis abortivis difformibus.

* *Perianthium polyphyllum.*

57. Miersia. Perianthium bilabiatum. Stamina biseriata, filamentis interiorum in urceolum obliquum connatis, antheris productis 6. *Chili.*

58. Gilliesia. Perianthium multifarium. Stamina biseriata, filamentis interiorum in urceolum obliquum connatis, antheris productis 3. *Chili.*

59. Trichlora. Perianthii segmenta biformia, exteriora lanceolata acuminata, interiora obovato-cuneata minuta. Stamina uniseriata antheris productis. *Peruvia.*

60. Gethyum. Perianthii segmenta conformia linearia acuminata. Stamina uniseriata, antheris productis 3. *Chili.*

** *Perianthium basi gamophyllum, tubo brevi campanulato præditum.*

61. Solaria. Perianthii segmenta conformia ovato-lanceolata. Stamina uniseriata, 3 fertilia, 3 sterilia minutissima. *Chili.*

62. Erinna. Perianthii segmenta conformia lineari-lanceolata. Stamina uniseriata, 3 fertilia, 3 sterilia minutissima. *Chili.*

63. Ancrumia. Perianthii segmenta biformia, exteriora lanceolata, interiora linearia. Stamina triseriata, fertilia 2, sterilia multa minutissima. *Chili.*

Subordo I. Liliaceæ veræ.

1. Borya, *Labill.*

Labill. Nov. Holl. i. 81, t. 107; *R. Br. Prod.* 286; *Endl. Gen.* No. 1170; *Kunth, Enum.* iv. 645; *Benth. Fl. Austral.* vii. 70.—Daviesia, *Lam. Ill. Suppl.* 10, *non Smith.*—Baumgartenia, *Spreng. Syst.* iii. 91.

Flores hermaphroditi. *Perianthium* gamophyllum album mem-

branaceum marcescens, tubo cylindrico, segmentis subæqualibus lanceolatis, flore expanso patulis. *Stamina* 6 ad faucem tubi inserta uniseriata, filamentis filiformibus, antheris basifixis ovoideis introrsum longitudinaliter dehiscentibus. *Ovarium* sessile ovoideum triloculare, ovulis in loculo paucis; *stylus* filiformis, stigmate capitato. *Capsula* membranacea loculicido-trivalvis, seminibus in loculo paucis turgidis, testa atra crustacea, albumine carnoso. *Herbæ suffruticosæ humiles perennes, fibris radicalibus duris, foliis angustissimis piniformibus confertis rigidis pungentibus, pedunculis nudis, floribus in capitulum globosum foliorum verticillo involucratum dispositis, singulis bracteis 2 glumaceis oblongis obtusis perianthii tubo æquilongis stipatis.*

Perianthii tubo segmenta lanceolata duplo breviora.
1. *B. nitida.*

Perianthii tubo segmenta linearia triplo breviora.
2. *B. septentrionalis.*

1. B. NITIDA, *Labill. loc. cit.*; *R. Br. Prod.* 286; *Kunth, Enum.* iv. 645; *F. Muell. Fragm.* vii. 87.—B. lucens, *Poir. Encyc.* viii. 615; *Kunth, loc. cit.*—B. scirpoidea, *Lindl. Swan River*, 57, t. 9; *Kunth, loc. cit.*—B. gracilis et cataractæ, *Endl. Pl. Preiss.* ii. 43. Herba suffruticosa erecta 2–6-pollicaris, caulibus simplicibus vel basi parce vel flabellato-ramosis, deorsum basibus foliorum delapsorum notatis. Folia congesta ascendentia sæpe falcata anguste linearia rigida pungentia 9–18 lin. longa ⅓ lin. lata, sæpissime glabra. Pedunculus strictus 1–4-pollicaris. Capitulum 3–6 lin. diam., involucri bracteis linearibus pungentibus capitulo sæpissime longioribus. Bracteæ propriæ oblongæ rigidæ obtusæ brunneæ vel atræ 2–3 lin. longæ. Perianthii tubus 2–3 lin. longus, segmentis lanceolatis quam tubus subduplo brevioribus. *Australia occidentalis.* Var. SUBLANOSA, *Benth.* (Drummond 98!), est forma nana flabellato-ramosa, foliis lanoso-pubescentibus 6–9 lin. longis; B. GRACILIS, *Endl.*, est forma debilis foliis paucis, involucri bracteis plerisque obsoletis; B. SPHÆROCEPHALA, *R. Br. Prodr.* 286, est varietas robusta, foliis 2–3 poll. longis strictis erectis, capitulis majoribus.

2. B. SEPTENTRIONALIS, *F. Muell. Fragm.* v. 41; *Benth. Fl. Austral.* vii. 71. Herba erecta suffruticosa semipedalis vel pedalis, caulibus simplicibus vel furcatis, vetustis basi longe cicatricibus foliorum delapsorum præditis. Folia producta dense conferta erecta rigida 1–1½ poll. longa, ¼–⅓ lin. lata, apice pungentia. Pedunculus strictus erectus 5–7-pollicaris. Capitulum semipollicare, involucri bracteis linearibus pungentibus 3–4 lin. longis. Bracteæ propriæ oblongæ obtusæ albidæ, sursum brunneæ, 3 lin. longæ. Perianthii tubus 4 lin. longus, segmentis linearibus quam tubus triplo brevioribus. *Australia orientalis in ditione Queensland,* Dallachy!

2. ARNOCRINUM, *Endl. et Lehm.*

Endl. et Lehm. Plant. Preiss. ii. 41; *Benth. Fl. Austral.* vii. 69.

Flores hermaphroditi. *Perianthium* gamophyllum violaceum membranaceum marcescens, tubo cylindrico, segmentis subæqualibus oblongis flore expanso patulis post anthesin spiraliter convolutis. *Stamina* 3 ad faucem tubi inserta, staminodiis filiformibus sæpissime alternantia, filamentis filiformibus brevibus, antheris connatis introrsum longitudinaliter dehiscentibus. *Ovarium* sessile obovoideum triloculare, ovulis in loculo 2; stylus filiformis, apice stigmatoso. *Capsula* membranacea loculicido-trivalvis, seminibus turgidis, testa atra crustacea, albumine carnoso. *Herbæ juncoideæ cæspitosæ haud bulbosæ, collo radicis sæpissime dense albo-lanoso, caulibus elongatis ramosis, foliis linearibus rigidulis plerisque radicalibus, floribus minutis dense capitulatis, singulis bracteis 2 glumaceis perianthii tubo æquilongis stipatis.*

Collum radicis dense albo-lanosum.
  Capitulum parce pilosum .... 1. *A. Drummondii.*
  Capitulum dense pilosum .... 2. *A. Preissii.*
Collum radicis haud lanosum.................... 3. *A. glabrum.*

1. A. DRUMMONDII, *Endl. Pl. Preiss.* ii. 41; *Benth. Fl. Austral.* vii. 69. Collum radicis crasse albo-lanosum. Folia radicalia anguste linearia rigidula uninervata erecta 1½–3 poll. longa plus minus pilosa. Caules pedales vel sesquipedales tenues rigidi glabri simplices vel parce ramosi, nodis paucis, superioribus foliis bracteiformibus minutis deltoideis scariosis, inferioribus foliis singulis linearibus reductis basi lanosis præditis. Capitula oblonga 6–9 lin. longa parce pilosa, bracteis exterioribus oblongo-lanceolatis 3 lin. longis dorso chartaceis viridibus margine hyalinis ciliatis. Perianthii tubus cylindricus 3 lin. longus, segmentis tubo æquilongis. *Australia occidentalis ad flumen Cygni etc.*, Drummond 777! Preiss 2640! &c.

2. A. PREISSII, *Lehm. Pl. Preiss.* ii. 42; *Benth. Fl. Austral.* vii. 70. Collum radicis crasse albo-lanosum. Folia radicalia pauca linearia glabra rigida 2–3 poll. longa. Caules 1–2-pedales robustiores et magis ramosi quam in *A. Drummondii*, ramis ad axillas lanosis, foliis superioribus minutis deltoideis scariosis, inferioribus radicalibus conformibus sed reductis. Capitula oblonga 6-9 lin. longa dense pilosa, bracteis exterioribus lanceolatis cuspidatis 3–4 lin. longis rigidis dorso pallidis pilis albidis lanosis ascendentibus firmulis vestitis, cuspidibus nigricantibus interdum leviter squarrosis. Perianthium 4 lin. longum, segmentis tubo æquilongis. *Aus-*

tralia occidentalis in ditione fluminis Cygni etc., Drummond 778! Preiss 2226! etc.

Species imperfecte cognita.

3. A. GLABRUM, *Baker.* Collum radicis haud lanosum. Folia radicalia linearia glabra semipedalia. Caules cæspitosi bipedales parce ramosi, ramorum axillis haud lanosis. Capitula globosa 3–4 lin. longa, bracteis pallidis firmis lanceolatis glabris acutis. Flores non vidi. *Australia occidentalis in ditione fluminis Cygni*, Drummond!

3. SOWERBÆA, *Sowerby.*

Smith in Trans. Linn. Soc. v. 160, t. 6; *R. Br. Prodr.* 285; *Endl. Gen.* No. 1138; *Kunth, Enum.* iv. 641; *Benth. Fl. Austral.* vii. 61.

Perianthium firmulum campanulatum 6-partitum persistens, segmentis subæqualibus oblongis vel lanceolatis dorso 1-nervatis, interioribus paulo longioribus. *Stamina* 3 hypogyna inclusa segmentis interioribus opposita, filamentis latis brevibus, antheris bilocularibus basifixis profunde bifidis introrsum longitudinaliter dehiscentibus; staminodia 3 ovata vel lanceolata segmentis exterioribus opposita interdum abortiva. *Ovarium* sessile triloculare, ovulis in loculo 2–6; stylus filiformis, apice stigmatosus. *Capsula* minuta chartacea loculicido-trivalvis, seminibus triquetris, testa nigra crustacea punctata, albumine carnoso, embryone minuto. *Herbæ glabræ acaules haud bulbosæ habitu* Allii, *fibris radicalibus gracilibus duris, foliis duris semiteretibus, floribus multis rubellis simpliciter umbellatis, pedicellis apice articulatis basi bracteis membranaceis instructis.*

Staminodia staminibus alternantia.
  Perianthii segmenta oblonga .... 1. *S. juncea.*
  Perianthii segmenta lanceolata .... 2. *S. laxiflora.*
Staminodia abortiva..................................... 3. *S. alliacea.*

1. S. JUNCEA, *Smith & auctt. locc. citt.* Folia rigidula lineari-subulata subpedalia, supra basin ½ lin. lata, facie plana dorso rotundata, basi dilatata, marginibus latis hyalinis. Scapus simplex gracilis teres pedalis vel sesquipedalis. Umbella densa globosa 12–15 lin. diam., pedicellis 3–6 lin. longis, bracteis exterioribus ovatis rubellis 2 lin. longis, interioribus albidis. Perianthium 3–4 lin. longum, segmentis oblongis 1¼–1½ lin. latis. Stamina perianthio duplo breviora staminodiis lanceolatis alternantia, antheris 1 lin. longis profunde bifidis. Capsula globosa 1 lin. longa, seminibus in loculo solitariis. *Australia orientalis a Queensland ad Victoriam.*

2. S. LAXIFLORA, *Lindl. in Bot. Reg.* 1841, t. 10; *Benth. Fl. Austral.* vii. 62. Folia semipedalia vel pedalia semiteretia minus rigidula quam in speciebus alteris, basi anguste hyalino marginata. Caulis pedalis vel sesquipedalis, basi interdum ramosus. Umbella 12–18 lin. diam., pedicellis 3–6 lin. longis, bracteis ovato-lanceolatis 1½–2 lin. longis, exterioribus viridulis. Perianthium 3 lin. longum, segmentis lanceolatis acutis. Stamina perianthio paulo breviora staminodiis alternantia. Capsula 1½–2 lin. longa, seminibus in loculo 3–4. *Australia occidentalis.*

3. S. ALLIACEA, *F. Muell. Fragm.* vi. 180; *Benth. Fl. Austral.* vii. 62. Folia rigidula lineari-subulata 6–9 poll. longa ½ lin. lata, facie plana, dorso rotundata, basi angustissime hyalino marginata. Caulis gracilis pedalis basi interdum ramosus. Umbella 6–9 lin. diam., pedicellis 2–3 lin. longis, bracteis minutis lanceolatis. Perianthium 2 lin. longum, segmentis oblongis 1 lin. latis. Stamina perianthio duplo breviora. Staminodia nulla. Capsula ¾–1 lin. longa, seminibus in loculo solitariis. *Australia borealis in terra Arnhem,* Gulliver!

4. ALANIA, *Endl.*

Endl. Gen. No. 1168; *Kunth, Enum.* iv. 644; *Benth. Fl. Austral.* vii. 62.

Perianthium campanulatum albidum firmulum 6-partitum, segmentis æqualibus lanceolatis diu ascendentibus dorso uninervatis. *Stamina* 6 hypogyna perianthio æquilonga, filamentis filiformibus, antheris minutis oblongis erectis introrsum longitudinaliter dehiscentibus. *Ovarium* ovoideum sessile triloculare, ovulis in loculo paucis superpositis; stylus filiformis, stigmate capitato. *Capsula* chartacea loculicido-trivalvis, seminibus minutissimis oblongis, testa nigra nitida crustacea, albumine carnoso, embryone minuto.

1. A. ENDLICHERI, *Kunth et Benth. locc. citt.* Herba suffruticosa glaberrima, caulibus simplicibus vel furcatis semipedalibus. Folia conferta anguste linearia patula uninervata 3–4 poll. longa ¼–⅓ lin. lata. Pedunculi nudi laterales foliis subæquilongi. Umbellæ inexpansæ conicæ spicatæ, bracteis pallidis chartaceis imbricatis, expansæ globosæ 9–12 lin. diam. 30–40-floræ pedicellis inarticulatis 2–3 lin. longis, bracteis minutis 1½–2 lin. longis. Perianthium 1 lin. longum. Capsula perianthio æquilonga. *Gallia nova australis in montibus Cæruleis,* A. Cunningham! etc.

5. JOHNSONIA, *R. Br.*

R. Br. Prodr. 287; *Endl. Gen.* No. 1172; *Kunth, Enum.* iv. 647; *F. Muell. Fragm.* vii. 86; *Benth. Fl. Austral.* vii. 68.

Flores conformes. *Perianthium* cylindricum 6-partitum marces-

cens, segmentis lanceolatis subæqualibus 3–5-nervatis diu ascendentibus. *Stamina* 3 inclusa profunde perigyna perianthii segmentis interioribus opposita, filamentis brevibus applanatis, antheris linearibus basifixis introrsum longitudinaliter dehiscentibus. *Staminodia* nulla. *Ovarium* sessile obovoideum triloculare, ovulis in loculo 2, unico pendulo, unico ascendente; stylus rectus filiformis, stigmate capitato. *Capsula* chartacea obovoidea loculicido-trivalvis, seminibus in loculo sæpissime solitariis oblongis conspicue strophiolatis, testa nigra nitida crustacea, albumine carnoso, embryone centrali. *Herbæ acaules dense cæspitosæ breviter rhizomatosæ, foliis rigidis anguste linearibus omnibus radicalibus, floribus minutis in capitulum oblongum solitarium aggregatis, bracteis magnis lanceolatis acutis planis chartaceis arcte imbricatis flores occultantibus.*

Elata, bracteis 9–12 lin. longis, inferioribus multis sterilibus reductis .... 1. *J. lupulina.*
Humiles, bracteis 5–6 lin .longis, inferioribus paucis sterilibus reductis.
Scapus productus .... 2. *J. pubescens.*
Scapus subnullus vel brevissimus .... 3. *J. acaulis.*

1. J. LUPULINA, *R. Br. Prodr.* 287; *Bauer Ill.* t. 1; *F. Muell. Fragm.* vii. 86; *Kunth, Enum.* ii. 648; *Benth. Fl. Austral.* vii. 68. Ubique glabra. Folia erecta anguste linearia pedalia et ultra 1 lin. lata subtiliter crebre nervata. Scapus gracilis strictus compressus 1½–2-pedalis supra capituli basin productus 1–3 poll. longus apice subpungente. Capitulum oblongum 1½–3 poll. longum, bracteis fertilibus 9–12 lin. longis stramineis concoloribus vel margine purpurascentibus, multis inferioribus sterilibus reductis. Perianthium 3–3½ lin. longum. Capsula obovoidea 3–3½ lin. longa. *Australia occidentalis,* Drummond 211! 350! Preiss 1579!—J. TERETIFOLIA, *Endl. Pl. Preiss.* ii. 40 (Preiss 1582!), est forma foliis subteretibus.

2. J. PUBESCENS, *Lindl. Swan River, App.* 57; *Kunth, Enum.* iv. 648; *Benth. Fl. Austral.* vii. 68.—J. hirta, *F. Muell. Fragm.* vii. 87, ex parte. Folia rigidula semipedalia ½ lin. lata glabra vel demum obscure pubescentia. Scapus gracilis glaber strictus 4–6-pollicaris supra capituli basin in bracteam 9–12 lin. longam productus. Capitulum oblongum 12–18 lin. longum, bracteis pallide stramineis vel brunneo vel margine rubro tinctis acutis arcte imbricatis 5–6 lin. longis ubique glabris vel margine obscure ciliatis, infimis paucis solitariis reductis. Perianthium 2 lin. longum. Capsula perianthio æquilonga. *Australia occidentalis,* Drummond! Oldfield!

Var. J. HIRTA, *Lindl. Swan River, App.* 57, t. 7; *Kunth, Enum.* iv. 648. Robustior, foliis ubique pilis brevibus albidis patentibus vel reflexis vestitis, capitulis 1½–2 poll. longis, bracteis primum dorso pubescentibus. *Australia occidentalis.*—J. LONGIFOLIA, *Endl. Pl. Preiss.* ii. 40 (*Preiss* 1584), est forma foliis subpedalibus, scapis 2–3 poll. longis.—J. MUCRONATA, *Endl. loc. cit.* (Preiss 1580!), est forma foliis pubescentibus angustioribus subteretibus, capitulis paucifloris, bracteis minoribus dorso viridulo tinctis.

3. J. ACAULIS, *Endl. Pl. Preiss.* ii. 41; *Benth. Fl. Austral.* vii. 69.—J. hirta, *F. Muell. Fragm.* vii. 87, *ex parte.* Folia glabra rigidula erecta 4–5 poll. longa ½ lin. lata. Scapi brevissimi vel subnulli supra capituli basin in bracteam linearem rigidam 5–6 lin. longam producti. Capitula ad cæspitem 1–4 oblonga 9–12 lin. longa, bracteis lanceolatis chartaceis glabris pallide brunneis 5–6 lin. longis, infimis paucis sterilibus reductis. Perianthium 2 lin. longum. Capsula perianthio æquilonga. *Australia occidentalis,* Drummond! Preiss 1581!

Var. DRUMMONDII, *Baker.* Robustior, foliis ¾–1 lin. latis ubique pubescentibus, capitulis ad cæspitem 6–8 majoribus, bracteis dorso pubescentibus. *Australia occidentalis,* Drummond!

6. STAWELLIA, *F. Muell.*

F. Muell. Fragm. vii. 85: *Benth. Fl. Austral.* vii. 67.

Flores dimorphi, capitulorum interiores minores vix fructiferi. *Perianthium* cylindricum marcescens 6-partitum, segmentis linearibus subæqualibus trinervatis diu ascendentibus. *Stamina* 3 profunde perigyna inclusa perianthii segmentis interioribus opposita, filamentis filiformibus, antheris linearibus basifixis introrsum longitudinaliter dehiscentibus. *Ovarium* sessile globosum triloculare, ovulis in loculo 2, unico pendulo, altero ascendente; stylus filiformis, stigmate capitato. *Capsula* chartacea globosa loculicido-trivalvis, seminibus in loculo sæpe solitariis, testa nigra nitida crustacea.

1. S. DIMORPHANTHA, *F. Muell. et Benth. locc. citt.* Herba glaberrima 5–6-pollicaris dense cæspitosa, radicibus firmis fibrosis. Folia radicalia teretia rigidula flexuosa 1½–2 poll. longa. Pedunculi stricte teretes gracillimi simplices nudi 3–4 poll. longi. Capitula solitaria terminalia, extrorsum foliis rigidulis reductis 1–2 poll. longis basi hyalino-dilatatis, introrsum bracteis minutis hyalinis deltoideis cuspidatis bracteata, floribus interioribus minoribus, filamentis applanatis. Capsula perianthio duplo brevior. *Australia occidentalis,* Drummond!

7. Laxmannia, *R. Br.*

R. Br. Prodr. 285; *Endl. Gen.* No. 1169; *Kunth, Enum.* iv. 642; *F. Muell. Fragm.* vii. 88; *Benth. Fl. Austral.* vii. 63.

Perianthium cylindricum sub-6-partitum, segmentis diu ascendentibus, exterioribus firmioribus oblongis vel lanceolatis, interioribus magis petaloideis inæquilongis. *Stamina* 6 inclusa, 3 segmentis exterioribus opposita subhypogyna, 3 segmentis interioribus opposita perigyna, filamentis brevibus, antheris minutis oblongis versatilibus introrsum longitudinaliter dehiscentibus. *Ovarium* substipitatum globosum triloculare, ovulis in loculo 2–4; stylus filiformis, stigmate capitato. *Capsula* membranacea loculicido-trivalvis, seminibus turgidis haud strophiolatis, testa nigra crustacea punctulata, albumine carnoso, embryone recto. *Herbæ perennes cæspitosæ haud bulbosæ, radicibus gracilibus, foliis teretibus rigidulis rudimentariis membranaceis hyalinis laceratis intermixtis, caulibus supra basin simplicibus vel ramosis, floribus dense capitulatis, capitulis globosis pedunculatis vel sessilibus, involucri bracteis chartaceis ovatis vel lanceolatis arcte imbricatis, receptaculi bracteis minutis laceratis.*

Caules supra collum radicis simplices, foliorum cæspitibus pedunculatis nullis.
  Capitula pedunculata.
    Flores pedicellati 3–3½ lin. longi ...... 1. *L. grandiflora.*
    Flores sessiles 2 lin. longi .... 2. *L. squarrosa.*
  Capitula sessilia vel subsessilia.
    Folia subulata .... 3. *L. sessilis.*
    Folia clavata basi angustata.............. 4. *L. brachyphylla.*
Caules supra collum radicis simplices vel parce ramosi, foliorum cæspite pedunculato unico. Species sola ... . 5. *L. minor.*
Caules supra collum radicis valde ramosi, foliorum cæspitibus pedunculatis pluribus.
  Capitula pedunculata...... 6. *L. gracilis.* 7. *L. ramosa.*
  Capitula sessilia.................................. 8. *L. sessiliflora.*

1. L. grandiflora, *Lindl. Swan River, App.* 56, t. 7; *Kunth, Enum.* iv. 643; *F. Muell. Fragm.* vii. 88, *ex parte*; *Benth. Fl. Austral.* vii. 64.—L. squarrosa, *Endl. in Pl. Preiss.* ii. 42, *non Lindl.* Caules supra collum

radicis simplices 6–12 lin. longi, foliis productis erectis confertis 1-2 poll. longis, rudimentariis dentibus elongatis subulatis præditis. Pedunculus semipedalis vel pedalis. Capitulum multiflorum 8–9 lin. diam., involucri bracteis pauciseriatis oblongis pallidis dorso brunneis, interioribus 3–4 lin. longis, receptaculi bracteis minutis ad basin fimbriatis. Perianthium albidum distincte pedicellatum, segmentis exterioribus lineari-oblongis subacutis 3–3½ lin. longis, interioribus obovatis 1–1½ lin. longis. Stamina segmentis interioribus subæquilonga. *Australia occidentalis in ditione fluminis Cygni, etc.*, Drummond 792! Preiss 1586! 1588!

Var. L. PALEACEA, *F. Muell. Fragm.* i. 159. Minor, foliis rigidis 3–6 lin. longis, pedunculis 1–2 poll. longis, capitulis minoribus, involucri bracteis multiseriatis. *Australia occidentalis*, Dempster!

2. L. SQUARROSA, *Lindl. Swan River, App.* 56; *Benth. Fl. Austral.* vii. 64; *Kunth, Enum.* iv. 643, *non Endl.*—L. pauciflora, acuta, sylvestris, *et* sessilis, *Endl. Pl. Preiss.* ii. 42.—L. grandiflora, *F. Muell. Fragm.* vii. 88, *ex parte.* Caules supra collum radicis simplices 12–18 lin. longi, foliis productis erectis confertis 1–2 poll. longis, rudimentariis membranaceis dentibus subulatis præditis intermixtis. Pedunculi 3–6 poll. longi. Capitulum multiflorum depresso-globosum 3–4 lin. diam., involucri bracteis pauciseriatis oblongis pallide brunneis, interioribus 2 lin. longis, receptaculi bracteis minutis longe fimbriatis. Perianthium albidum sessile 2 lin. longum, segmentis exterioribus lanceolatis, interioribus oblongis 1–1½ lin. longis. *Australia in ditione fluminis Cygni*, Drummond! Preiss 1589–1592! etc.

3. L. SESSILIS, *Lindl. Swan River, App.* 56; *Endl. in Pl. Preiss.* ii. 42; *Benth. Fl. Austral.* vii. 67.—L. grandiflora, *F. Muell. Fragm.* vii. 88, *ex parte.* Caules supra collum radicis brevissimi, foliis productis confertis subulatis squarrosis 4–8 lin. longis ⅙ lin. latis, rudimentariis membranaceis copiosis dentibus multis subulatis elongatis instructis intermixtis. Capitula sessilia pauciflora campanulata 2–3 lin. diam., involucri bracteis pauciseriatis pallide brunneis, intimis lanceolatis acutis 2 lin. longis, receptaculi bracteis ad basin fimbriatis. Perianthium sessile albidum 2 lin. longum, segmentis exterioribus lineari-oblongis, interioribus quam exteriora triplo brevioribus. *Australia occidentalis in ditione fluminis Cygni etc.*, Drummond! Preiss 1590! etc.

4. L. BRACHYPHYLLA, *F. Muell. Fragm.* i. 158; *Benth. Fl. Austral.* vii. 66.—L. grandiflora, *F. Muell. Fragm.* vii. 88, *ex parte.* Caules supra collum radicis simplices 6–18 lin. longi, foliis productis oblanceolato-clavatis aristatis squarrosis 2-3 lin. longis ½ lin. latis, rudimentariis membranaceis copiosis dentibus elongatis subulatis intermixtis. Capitula sessilia hemisphærica multiflora 3–4 lin. diam., involucri bracteis pauciseriatis oblongis obtusis, intimis 1½ lin. longis, receptaculi bracteis profunde fimbriatis. Perianthium sessile 2 lin. longum, segmentis exterioribus lineari-ob-

longis obtusis, interioribus quam exteriora 3–4plo brevioribus. *Australia occidentalis in ditione sinus Regis Georgii*, Drummond 445! etc.

5. L. MINOR, *R. Br. Prodr.* 286; *Kunth, Enum.* iv. 642; *Benth. Fl. Austral.* vii. 65.—L. Roei, *Endl. Pl. Preiss.* ii. 42; *F. Muell. Fragm.* vii. 88. Caules supra radicis collum simplices vel parce ramosi, foliorum cæspite unico pedunculato. Folia producta rigida 6–12 lin. longa, rudimentariis albidis dentibus paucis elongatis subulatis instructis intermixtis. Pedunculi gracillimi stricti 2–6 poll. longi. Capitula pauciflora depresso-globosa 3–5 lin. diam., involucri bracteis pauciseriatis brunneis membranaceis, interioribus 2–2½ lin. longis, receptaculi bracteis brevissimis breviter fimbriatis. Perianthium albidum sessile oblongum 2–2½ lin. longum, segmentis interioribus quam exteriora paulo brevioribus. *Australia occidentalis in ditione sinus Regis Georgii*, R. Brown! Preiss 1585!

6. L. GRACILIS, *R. Br. Prodr.* 286; *Endl. Icon.* t. 97; *Kunth, Enum.* iv. 642; *F. Muell. Fragm.* vii. 88; *Benth. Fl. Austral.* vii. 65.—L. illecebrosa, *Reich. fil. Beitr.* 72. Herba glabra rigidula semipedalis vel pedalis, caulibus strictis gracillimis supra collum radicis valde ramosis, foliorum cæspitibus multis pedunculatis, internodiis superioribus 3–12 lin. longis. Folia producta subteretia 6–12 lin. longa ⅛ lin. lata, facie canaliculata, apice minute mucronata, rudimentariis albis membranaceis ciliatis intermixtis. Pedunculi stricti 2–8-pollicares. Capitula pauciflora vel multiflora 3–4 lin. diam., involucri bracteis paucis quam flore multo brevioribus, intimis 1 lin. longis, receptaculi bracteis profunde fimbriatis. Perianthium breviter pedicellatum albidum vel rubro tinctum 2–2½ lin. longum, segmentis exterioribus oblongis obtusis, interioribus lanceolatis quam exteriora sæpissime longioribus. Capsula 1¼ lin. longa mucronata breviter pedicellata. *Australia orientalis a Queensland ad Victoriam.*

7. L. RAMOSA, *Lindl. Swan River, App.* 56; *Endl. Pl. Preiss.* ii. 43; *Kunth, Enum.* iv. 643; *F. Muell. Fragm.* vii. 88; *Benth. Fl. Austral.* vii. 66. Habitus omnino *L. gracilis* orientalis. Folia producta teretia mucronata 6–15 lin. longa ⅛ lin. lata. Pedunculi breviores (1–4 poll. longi). Capitula pauciflora globosa 3–4 lin. diam., involucri bracteis ½–1 lin. longis, receptaculi bracteis minutis fimbriatis. Perianthium subsessile 1½–2 lin. longum, segmentis exterioribus albis brunneo costatis, interioribus quam exteriora paulo brevioribus. *Australia occidentalis in ditione fluminis Cygni*, Drummond! Preiss 1587!

8. L. SESSIFLORA, *Decne, Fl. Timor.* 35, t. 16; *Kunth, Enum.* iv. 643.—*Benth. Fl. Austral.* vii. 66.—L. minor, *Hook. fil. Fl. Tasm.* ii. 60; *F. Muell. Fragm.* vii. 89, *non R. Br.* Herba glabra erecta dense cæspitosa 1–4-pollicaris, vel interdum ramis decumbentibus longioribus prædita, valde ramosa, foliorum cæspitibus pedunculatis pluribus. Folia producta teretia 3–9 lin. longa, rudimentariis copiosis membranaceis dentibus subulatis elongatis præditis commixta. Capitula sessilia pauciflora 3–4 lin. diam.,

involucri bracteis paucis ½–1 lin. longis, receptaculi bracteis minutis fimbriatis. Perianthium sessile 1½ lin. longum, segmentis exterioribus quam interiora sæpissime paulo brevioribus. *Australia australis et occidentalis, ad 5000 pedes in ditione Victoriæ ascendens.*

Var. CONGESTA, *Baker.* Rami brevissimi, internodiis subnullis, foliis productis paucis 1–1½ lin. longis, rudimentariis membranaceis copiosis ciliatis intermixtis; capitula 1½ lin. diam., floribus stramineis 1 lin. longis. *Australia occidentalis ad ripas fluminis Murchison,* Oldfield!

8. APHYLLANTHES (*Tourn.*), *Linn.*

Linn. Gen. No. 145; *Endl. Gen.* No. 1171; *Kunth, Enum.* iv. 646; *Salisb. Gen.* 72.

Perianthium infundibulare tenerum membranaceum 6-partitum, segmentis æqualibus obovato-oblongis obtusis unguiculatis dorso 1-nervatis, unguibus in tubum conniventibus, flore expanso superne falcatis. *Stamina* 6 perigyna inclusa, filamentis filiformibus, antheris ellipticis dorsifixis versatilibus introrsum longitudinaliter dehiscentibus. *Ovarium* stipitatum obovoideo-trigonum triloculare, ovulis in loculo solitariis; stylus filiformis, stigmate tricuspidato. *Capsula* membranacea loculicido-trivalvis, seminibus ovoideis haud strophiolatis, testa nigra crustacea, albumine carnoso, embryone cylindrico.

1. A. MONSPELIENSIS, *Linn. Sp.* 422; *Bot. Mag.* t. 1132; *DC. in Red. Lil.* t. 483; *Gren. Fl. France,* iii. 225; *Moggr. Cont. Ment.* t. 89.—A. juncea, *Salisb. Parad.* t. 9. Herba glabra dense cæspitosa, rhizomate brevi, fibris radicalibus tenacibus ramosis. Caules rigiduli semipedales vel pedales, basi foliis 2–3 scariosis brunneis cincti. Capitula lineari-oblonga 1–2-flora, bracteis interioribus 5 lanceolatis acutis pallide brunneis 3–4 lin. longis basi connatis, exterioribus paucis arcte imbricatis minoribus liberis. Perianthium 8–9 lin. longum violaceum vel album. *Lusitania, Hispania, Gallia meridionalis, Italia borealis.*

Subordo II. COLCHICACEÆ.

9. COLCHICUM (*Tourn.*), *Linn.*

Linn. Gen. No. 457; *Steven in Act. Mosc.* vii. 65, t. 13–16; *Kunth, Enum.* iv. 138; *Endl. Gen.* No. 1086.—Fouha, *Pomel, Mat. Fl. Atlant.* 2.—Monocaryum (*R. Br.*), *Schultes, Syst. Veg.* No. 1460 (forma abnormalis),=Paludaria, *Salisb. Gen.* 53.

Perianthium infundibulare, tubo elongato cylindrico sulcato, limbi erecti segmentis conniventibus diu imbricatis subconformibus

oblanceolato-oblongis. *Stamina* 6 inclusa ad faucem perianthii inserta, 3 interiora sæpe altiora filamentis filiformibus antheris linearibus vel oblongis versatilibus ad faciem interiorem dorsifixis, margine dehiscentibus. *Ovarium* triloculare, ovulis in loculo crebris superpositis, stylis liberis filiformibus ex tubo longe exsertis, apice stigmatoso integro unilaterali sæpissime plus minusve falcatis. *Capsula* oblonga vel globosa ventricosa ex apice septicide trivalvis, seminibus pluribus globosis, testa brunnea ad umbilicum ventralem strophiolata, embryone cylindrico ab hilo remoto, albumine carnoso. *Herbæ acaules bulbosæ, cormo magno tunicis chartaceis supra collum longe productis vestito, foliis sæpe hysteranthiis vernalibus carnoso-herbaceis linearibus vel loratis vel oblongo-loratis, floribus ad spatham sæpe pluribus successivis lilacino-purpureis raro luteis.*

Stirps C. VARIEGATI. Folia hysteranthia vernalia. Flores autumnales. Perianthii limbus tessellatus.

Perianthii limbus conspicue tessellatus.
- Folia patula humifusa.
  - 1. *C. variegatum.* 2. *C. pulchrum.*
- Folia ascendentia.
  - 3. *C. agrippinum.* 4. *C. Bivonæ.*
- Folia ignota. 5. *C. amabile.*

Perianthii limbus obscure tessellatus.
- Grandiflora.
  - 6. *C. lusitanum.* 7. *C. Levieri.*
  - 8. *C. Tenorii.* 9. *C. Sibthorpii.*
- Parviflorum. 10. *C. variopictum.*

Stirps C. AUTUMNALIS. Folia hysteranthia vernalia. Flores grandes autumnales. Perianthii limbus haud tessellatus.

Folia lingulata vel oblonga 3–4 poll. lata.
- 11. *C. speciosum.* 12. *C. byzantinum.*

Folia linearia vel lanceolata, 1–2 poll. lata.
- Styli apice distincte falcati, stigmate decurrente.
  - 13. *C. autumnale.* 14. *C. turcicum.*
- Styli apice subrecti, stigmate subcapitato. 15. *C. lætum.*

Folia ignota. 16. *C. persicum.*

Stirps C. ARENARII. Folia hysteranthia vernalia. Flores parvi autumnales. Perianthii limbus haud tessellatus.

Flores ad cormum plures.
- 17. *C. Troodi.* 18. *C. polyphyllum.* 19. *C. umbrosum.*

Flores ad cormum 1–2, raro 3–4.
Styli apice distincte falcati, stigmate decurrente.
20. *C. neapolitanum.* 21. *C. parnassicum.* 22. *C. corsicum.*
Styli apice subrecti, stigmate subcapitato.
23. *C. arenarium.* 24. *C. alpinum.* 25. *C. lingulatum.*

Stirps C. MONTANI. Folia synanthia hiemalia vel vernalia. Perianthii limbus haud tessellatus.
Flores roseo-lilacini, antheris parvis.
Antheræ oblongæ purpureæ .... 26. *C. montanum.*
Antheræ lineares luteæ.
27. *C. Steveni.* 28. *C. Szovitsii.*
Flores lutei, antheris magnis ... . 29. *C. luteum.*

1. C. VARIEGATUM, *Linn. Sp.* 485; *Bot. Mag.* t. 1028; *Kunth, Enum.* iv. 239; *Guss. Syn. Sic.* i. 437.—C. Parkinsoni, *Hook. fil. in Bot. Mag.* t. 6090.—C. fritillaricum chiense, *Parkins. Parad.* 156, 155. fig. 5.—C. chionense, *Hort.* Cormus ovoideus 1 poll. crassus, tunicis firmis atrofuscis 3–4 poll. supra collum productis. Folia hysteranthia vernalia 2–3 patula subrecumbentia lanceolata semipedalia obscurius viridia quam in *C. autumnali*, medio 12–15 lin. lata, marginibus undulatis. Flores autumnales 2–3 ad spatham. Perianthii tubus albidus 3–4-pollicaris; limbus lilacino-purpureus conspicue tessellatus 2 poll. longus, segmentis oblongo-lanceolatis infra medium 5–8 lin. latis venis circiter 15 percursis e medio ad apicem obtusiusculum attenuatis. Stamina perianthio paulo breviora, filamentis saturate purpureis, antheris purpureis 4 lin. longis. Styli stamina superantes, apice stigmatoso vix curvati. *Insulæ Levantinæ et Asia Minor.* V. v. in hort. Barr.

2. C. PULCHRUM, *Herbert MSS.* Folia 5–10 vernalia lorata 4–5 poll. longa 9–14 lin. lata canaliculata subrecumbentia obtusa undulata. Flores autumnales sæpius bini. Perianthii tubus albus 1–1½ poll. longus; limbus 2–2¼-pollicaris pulchre tessellatus, segmentis circiter 1 poll. latis. Filamenta alba basi lutescentia 3–4½ lin. longa, antheris purpurascentibus. Styli pallidi antheras parum superantes, apice stigmatoso curvati. *Cephalonia et Epirus,* hort. Herbert, anno 1846 (non vidi).

3. C. AGRIPPINUM, *hort. Angl.*—C. tessellatum, *hort. Angl.* Cormus ovoideus 1–1½ poll. crassus, tunicis fuscis 3 poll. supra collum productis. Folia 3–4 vernalia suberecta lanceolata 6–9 poll. longa infra medium 12–15 lin. lata obscurius viridia quam in *C. autumnali,* marginibus valde undulatis. Flores autumnales, 2–4 ad spatham. Perianthii tubus 2–4-pollicaris albidus; limbus 1½–2½-pollicaris pulchre lilacino-purpureus conspicue albo tessellatus; segmenta oblongo-lanceolata, infra medium 6–9 lin. lata, e medio ad apicem obtusiusculum valde attenuata, mar-

ginibus undulatis, venis circiter 15 percursa. Filamenta 12–18 lin. longa saturate purpurea, antheris lineari-oblongis purpureis 3–4 lin. longis. Styli purpurascentes staminibus æquilongi vel superantes, apice stigmatoso leviter curvati. *In hortis Anglicis sæpe cultum.* Flores omnino *C. variegati*, sed recedit habitu robustiore et foliis suberectis.

4. C. Bivonæ, *Guss. Prod.* i. 453; *Syn. Sic.* i. 437; *Kunth, Enum.* iv. 139; *Parl. Fl. Ital.* iii. 173; *Reich. Ic. Germ.* fig. 952.—C. variegatum, *Biv. Bern. Cent.* i. 27, *excl. syn.*; *Red. Lil.* t. 238.—C. neapolitanum fritillaricum, *Parkins. Parad. Terrest.* 156, 155. fig. 4. Cormus ovoideus 1½ poll. crassus, tunicis duris fuscis 3–4 poll. supra collum productis. Folia 6–9 vernalia suberecta lorata subpedalia canaliculata, medio 9–15 lin. lata, apice subcucullata, margine plana. Flores autumnales, 1–6 ad spatham. Perianthii tubus 3–5-pollicaris; limbus 1½–2-pollicaris pulchre purpureus conspicue albo tessellatus; segmenta oblanceolato-elliptica obtusiuscula 6–9 lin. lata, venulis crebris 16–18 percursa. Filamenta 6–9 lin. longa, antheris purpureis lineari-oblongis 4 lin. longis. Styli pallide purpurascentes stamina longe superantes, apice stigmatoso leviter curvati. Capsulæ subsolitariæ oblongæ apice obtusiuscule tricuspidatæ. *Sicilia in apricis collibus et montosis,* Tineo! Parlatore! etc. Formæ affines imperfecte cognitæ a Calabria, *Gussone,* Arcadia, *Von Heldreich*! Dalmatia, *Visiani* (C. Bivonæ, *Visiani, Fl. Dalm.* 156; C. Visianii, *Parl. Fl. Ital.* iii. 175), et Mauritania ad montem Tezi, alt. 7000–8000 pedes, *Hook. fil. et Ball*! exstant.

5. C. amabile, *Heldr. in Herb. Græc. Norm. Exsicc.* No. 764; *Atti Intern. Congr. Firenz.* 1874, 228. Cormus ovoideo-oblongus nuce avellana paulo major, tunicis fuscis. Folia hysteranthia ignota. Flores vernales sæpissime solitarii, interdum bini. Perianthii tubus 3–4½-pollicaris; limbus 1½-pollicaris, segmentis oblongo-ellipticis pulchre tessellatis 3–4 lin. latis. Styli apice stigmatoso curvati. *Eubœa, in cacumine montis Xerobuni, alt.* 4800 *pedes,* Von Heldreich (non vidi).

6. C. lusitanum, *Brotero, Phyt. Lusit.* 211, tabb. 173–4.—C. lusitanicum fritillaricum, *Parkins. Parad.* 154, 155. fig. 3.—C. Bivonæ, *Willk. & Lange, Pl. Hisp.* i. 194, *ex parte.* Cormus globosus 1½–2 poll. crassus, tunicis firmis nitidis fuscis 3–4 poll. supra collum productis. Folia hiemalia 4–5 suberecta acuta lorata 8–15 poll. longa 1–2 poll. lata supra basin plana obscurius viridia quam in *C. autumnali,* marginibus haud undulatis. Flores autumnales ad spatham sæpissime plures. Perianthii tubus albidus 4–6-pollicaris; limbus 1½–2-pollicaris lilacino-purpureus obscure tessellatus, segmentis oblanceolato-ellipticis obtusis 5–7 lin. latis venis crebris 15–20 percursis. Stamina limbo subduplo breviora, filamentis 6–9 lin. longis, antheris luteis 3–4 lin. longis. Styli purpurascentes antheras superantes apice stigmatoso leviter curvati. Capsulæ aggregatæ oblongæ 1½ poll. longæ. *Lusitania, in collibus saxosis ditionis Estremaduræ,* Maw!

Goetze! etc. v. v. in Hort. Kew. C. TODARII, *Parlat. Fl. Ital.* iii. 178, italicum, ex descriptione non potui segregare. *C. Bivonæ* hispanicum, Willk. et Lange, non vidi.

7. C. LEVIERI, *Janka in Œster. Bot. Zeitschrift*, 1875, 82. Cormus parvus, tunicis chartaceis brunneis. Folia 4–5 vernalia suberecta lineari-lorata e medio utrinque angustata. Flores autumnales 1–7 ad spatham. Perianthii tubus albidus 4–6-pollicaris; limbus lilacino-purpureus obscure tessellatus 2–3 poll. longus, segmentis oblanceolatis venis circiter 20 percursis, exterioribus longioribus. Stamina stylis breviora, antheris linearibus. Styli limbo subduplo breviora, stigmatibus uncinatis unilateralibus profunde sulcatis. Capsulæ eis *C. autumnalis* multo minores subglobosæ spongiosæ. *Italia in pratis ditionis Florentiæ*, Janka (non vidi).

8. C. TENORII, *Parl. Fl. Ital.* iii. 157.—C. byzantinum, *Tenore, Fl. Nap.* iii. 397, *non Ker.*—C. Bivonæ, *Tenore, Fl. Nap. Prodr. App.* v. 11, *non Guss.*—C. Bisignani, *Tenore, teste Janka.* Cormus magnitudine mediocris, tunicis castaneis. Folia vernalia circiter 5 suberecta late lorata obscure viridia supra basin plana, marginibus haud undulatis. Flores autumnales 3–4 ad spatham. Perianthii tubus albidus 2–5-pollicaris; limbus saturate lilacino-purpureus obscure tessellatus 1½–2 poll. longus, segmentis oblongo-oblanceolatis obtusis 6–8 lin. latis, venis 12–16 percursis. Filamenta 9–12 lin. longa, antheris purpurascentibus 3–4 lin. longis. Styli purpurascentes antheras superantes apice stigmatoso vix incurvati. Capsulæ ovato-subglobosæ apice breviter tricuspidatæ. *Italia in pratis ditionis Neapolis*, v. v. ex hort. Elwes.

9. C. SIBTHORPII, *Baker.*—C. latifolium, *Sibth. & Smith, Fl. Græc.* t. 350, quoad flores non folia. Cormus globosus 1½–2 poll. crassus, tunicis firmis castaneis longe supra collum productis. Folia 4–5 hysteranthia vernalia. Flores autumnales ad spatham plures. Perianthii tubus sæpe semipedalis; limbus lilacino-purpureus obscure tessellatus 21–24 lin. longus, segmentis oblongo-oblanceolatis obtusis 8–9 lin. latis, venis 20 vel ultra percursis. Stamina perianthio triente breviora, antheris 4 lin. longis. Styli antheras superantes, apice stigmatoso leviter curvati. *Græcia in montibus Atticæ*, Von Heldreich! *C. variegatum*, Sieber, Herb. Crete Exsic.! non Linn., est forma imperfecte cognita, verisimiliter affinis.

10. C. VARIOPICTUM, *Janka in Œster. Bot. Zeitschrift*, 1875, 83. Cormus magnitudine nucis *Juglandis*, tunicis brunneis firmis vestitus. Folia 5–9 vernalia linearia stricta spithamæa sæpissime 6–8 raro 12 lin. lata, marginibus haud undulatis. Flores autumnales 1–5 ad spatham. Perianthii tubus 4–5-pollicaris; limbus pollicaris vel paullo longior obscure tessellatus, segmentis oblanceolatis acutiusculis, venis circiter 20 undulatis percursis, exterioribus longioribus. Stamina limbo subduplo breviora, antheris primum rubellis, demum luteis. Styli elongati interdum exserti, stigmatibus arcuatis profunde sulcatis. Capsulæ vix 12 lin. longæ, apice

abrupte longiuscule tricuspidatæ. *Italia, in pratis ditionis Neapolis,* Janka (non vidi). Est forma *C. neapolitani,* teste Borbas in Just. Bot. Jahrb. 1876, 1066.

11. C. SPECIOSUM, *Steven in Act. Mosc.* vii. 69, t. 15; *Kunth, Enum.* iv. 139; *Led. Fl. Ross.* iv. 204; *Hook. fil. in Bot. Mag.* t. 6078; *Fl. Mag.* n. s. t. 235; *Garden,* June 1877. Cormus pro genere maximus 2 poll. crassus, tunicis brunneis supra collum longe productis. Caulis foliiferus interdum pedalis. Folia 4–5 hysteranthia vernalia suberecta lingulata 12–15 poll. longa, medio 3–4 poll. lata obtusa e medio ad basin angustata lucide viridia, marginibus haud undulatis. Flores autumnales ad spatham 1–4. Perianthii tubus 5–9-pollicaris, duplo crassior quam in *C. autumnali,* sulcatus; limbus 3–3½-pollicaris pallide vel saturate lilacino-purpureus haud tessellatus, segmentis obovato-oblongis obtusis 9–15 lin. latis venis 30–40 percursis. Stamina limbo 2–3plo breviora, antheris luteis 5–6 lin. longis. Styli antheras superantes vel æquilongi apice stigmatoso unilaterali 2 lin. longo distincte falcati. Capsulæ oblongæ 1½–2 poll. longæ profunde sulcatæ. *Caucasus,* Steven! Ledebour! &c. (V. v. in Hort. Kew. &c.) Facile princeps specierum omnium generis. C. ILLYRICUM, *Friv.* (C. latifolium, *Griseb. Pl. Rumel.* ii. 378), est planta Macedonica eadem vel arcte affinis.

12. C. BYZANTINUM (*Parkins. Theat.* 154, 155. fig. 2), *Ker in Bot. Mag.* sub tt. 1028, 1122; *Schultes, Syst. Veg.* vii. 1509; *Kunth, Enum.* iv. 140; *Griseb. Fl. Rumel.* ii. 378; *Regel, Gartenflora,* t. 755.—C. floribundum, *Lawson*; *Salisb. in Trans. Hort. Soc.* i. 329.—C. latifolium byzantinum, *Clus. Hist.* i. 199–200.—C. latifolium, *Sibth. & Sm. Fl. Græc.* t. 350, quoad folia.—C. transsilvanicum, *Schur. Transyl.* 679.—C. æstivale, *Boreau, Fl. Cent.* edit. 3, vol. ii. 612.—C. autumnale, var. latifolium, *Red. Lil.* t. 468. Cormus globosus pro genere magnus 2–3 poll. crassus, tunicis brunneis supra collum 3–4 poll. productis. Caulis foliiferus semipedalis. Folia 5–6 hysteranthia vernalia suberecta oblonga obtusa saturate viridia verticaliter plicata 9–12 poll. longa, medio 3–4, interdum 5–6 poll. lata, marginibus haud undulatis. Flores autumnales sæpe 12–20 ad spatham. Perianthii tubus 2–6-pollicaris, 1½–2 lin. crassus; limbus lilacino-purpureus haud tessellatus 1½–2 poll. longus, segmentis oblanceolato-oblongis obtusis 9–12 lin. latis, venis circiter 20 percursis. Filamenta 9–12 lin. longa, antheris luteis 4 lin. longis. Styli staminibus æquilongi, apice stigmatoso breviore, et minus falcati quam in *C. autumnali.* Capsulæ aggregatæ oblongæ 1½–2 poll. longæ. *Transylvania et Byzantium.* V. v. in hort. Barr. &c. A *C. autumnali* præsertim recedit foliis latis et floribus numerosioribus.

13. C. AUTUMNALE, *L. Sp.* 485; *Endl. Bot.* t. 113; *Red. Lil.* t. 228; *Schultes, Syst.* vii. 1511; *Kunth, Enum.* iv. 140; *Reich. Ic. Germ.* t. 949, 950; *Parl. Fl. Ital.* iii. 179.—C. crociflorum, *Anders. in Bot. Mag*

t. 2673.—C. multiflorum, *Brot. Lusit.* i. 597.—C. anglicum album *et* C. anglicum purpureum, *Parkins. Theat.* 153–4.—C. patens, *Schultz in Bot. Zeit.* 1826, 130. Cormus ovoideus 15–18 lin. crassus, tunicis chartaceis atrofuscis 2–4 poll. supra collum productis. Caulis foliiferus 3–4-pollicaris; folia vernalia 3–4 (raro 5–6) suberecta lorata 9–12 poll. longa, 1½–2 poll. lata, ad apicem obtusum attenuata, lucide viridia, marginibus haud undulatis. Flores 1–4, raro 5–6, autumnales. Perianthii tubus pallidus 4–6-pollicaris; limbi lilacino-purpurei haud tessellati 21–24 raro 30 lin. longi, segmentis oblanceolato-oblongis venis 15–20 percursis, exterioribus 6–8 lin. latis, interioribus paulo minoribus. Stamina limbo 2–3plo breviora, antheris luteis 3–4 lin. longis. Styli antheras sæpe superantes, apice stigmatoso unilaterali 2–3 lin. longo, falcati. Capsulæ oblongæ ventricosæ 1½–2 poll. longæ. *Europa centralis, occidentalis et meridionalis, Mauritania, Algeria.* C. VERNUM, *Schrank, Bav.* i. 631; C. vernale, *Hoffm. Germ.* i. 174; *Reich. Ic. Germ.* t. 951; C. præcox, *Spenner, Frib.* 215, est status floribus fortuiter vernalibus minoribus, genitalibus sæpissime plus minus imperfectis. C. PATENS, *Schultz*, est forma longistylis, perianthii segmentis magis patentibus.

Var. C. PANNONICUM (*Parkins. Theat.* 154, 155. fig. 1), *Griseb. et Schenck in Wiegm. Archiv*, 1852, 359; *Walp. Ann.* v. 150.—C. polyanthos, *Ker in Bot. Mag. sub* t. 1028.—C. multiflorum, *Schur. Sert.* 76, ab typo recedit habitu robustiore, cormo majore, foliis paulo latioribus, floribus sæpe numerosioribus. *Transylvania*, Janka! *Croatia*, Huguenin! &c.

14. C. TURCICUM, *Janka in Œster. Bot. Zeitsch.* 1873, 242. Cormus magnus, tunicis fusco-nigrescentibus supra collum longe productis. Folia vernalia hysteranthia 6–9, exteriora lanceolata e medio utrinque angustata canaliculata patentissima humifusa undulata, interiora plana linearia suberecta, omnia anguste cartilagineo-marginata, ciliis retrorsis vel patentibus prædita, supra læte lucide viridia, subtus grisea. Flores autumnales 3–8 omnino *C. autumnalis*, segmentis oblongo-oblanceolatis obtusis nervis circiter 20 percursis. Filamenta uniseriata. Styli filamenta superantes vel breviores, apice stigmatoso curvati. Capsulæ parvæ exquisite trisulcatæ. *In agro Byzantino*, Janka. Folia *C. variegati*, cum floribus *C. autumnalis.*

15. C. LÆTUM, *Steven in Mém. Mosc.* vii. 66, t. 13; *Kunth, Enum.* iv. 140; *Led. Ross.* iv. 204; *Dcne. in Ann. Sc. Nat.* ser. 2, vol. iv. 345; *Regel, Gartenfl.* 1862, t. 379.—C. Kotschyi, *Boiss.*; *Walp. Ann.* vi. 149.—C. Balansæ, *Planch. in Ann. Sc. Nat.* ser. 4, vol. iv. 145.—C. candidum, *Schott & Kotschy in Kotschy, Pl. Cilic.* No. 91 *a*, 333. Cormus ovoideus 1½–2 poll. crassus, tunicis castaneis 4–6 poll. supra collum productis. Caulis foliiferus demum 5–6-pollicaris. Folia 4–6 hysteranthia vernalia lingulata suberecta pallide viridia interdum pedalia 1–2 poll. lata. Flores

autumnales sæpe plures ad spatham. Perianthii tubus 2–6-pollicaris; limbus 2–2½-pollicaris pallide lilacinus haud tessellatus, segmentis oblanceolatis obtusis 4–6 lin. latis, venis 12–20 percursis. Stamina limbo 2–3plo breviora, antheris luteis 3–4 lin. longis. Styli stamina sæpissime superantes, apice stigmatoso subcapitati subrecti. Capsulæ ovoideæ subpollicares. *Tauria, Caucasus, Asia Minor, Syria, Persia.* Ab *C. autumnali* recedit foliis et perianthii segmentis angustioribus, stigmatibus brevibus vix curvatis, capsulis minoribus. V. v. in Hort. Kew. &c.

16. C. PERSICUM, *Baker.* Cormus magnus globosus, tunicis atrofuscis 4–5 poll. supra collum productis. Folia ignota hysteranthia. Flores autumnales 10–12 ad spatham. Perianthii tubus 3–4-pollicaris; limbus 2 poll. longus saturate purpureus haud tessellatus, segmentis oblanceolato-oblongis obtusis 5–6 lin. latis. Filamenta subpollicaria, antheris luteis 5–6 lin. longis. Styli limbo triente breviores, apice stigmatoso subrecti subcapitati. *Persia, in ditione Laristan,* Loftus! (Herb. Mus. Brit.).

17. C. TROODI, *Kotschy in Unger & Kotschy, Cyprus,* 190. Cormus magnitudine mediocri, tunicis fuscis. Folia 3–4 hysteranthia vernalia lorata suberecta 6–12 poll. longa, 9–12 lin. lata, ad apicem obtusum angustata. Flores autumnales 4–5 ad spatham. Perianthii tubus 2–3-pollicaris; limbus pollicaris lilacino-purpureus haud tessellatus, segmentis lanceolatis acutis venis 10–12 percursis. Stamina limbo duplo breviora, antheris luteis. Styli stamina superantes, apice stigmatoso brevi curvato. Capsulæ aggregatæ ovoideo-oblongæ 8–9 lin. longæ distincte pedicellatæ, carpellis apice longe rostratis. *Cyprus, in montibus, alt.* 4000 *pedes,* Kotschy, 604! Ab *C. neapolitano* præsertim recedit habitu robustiore, floribus pluribus, foliis latioribus.

18. C. POLYPHYLLUM, *Boiss. & Held. in Boiss. Diagn.* ser. 2, No. iv. 121. Cormus ovoideus magnitudine nucis parvæ, tunicis membranaceis 3 poll. supra collum productis. Folia plura hysteranthia linearia semipedalia 3 lin. lata. Flores autumnales 6–10 ad spatham. Perianthii tubus 4–5-pollicaris; limbus lilacinus subpollicaris haud tessellatus, segmentis oblanceolatis obtusis 2 lin. latis nervis 7–8 percursis. Filamenta limbo subduplo breviora, antheris luteis. Styli antheras paulo superantes apice stigmatoso brevi unilaterali curvato. Capsulæ oblongæ, carpellis breviter rostratis. *Asia Minor, in Cilicia ad radices Tauri,* Balansa, Reinert, Heldreich. C. TRAPEZUNTICUM, *Boiss. in Balansa, Pl. Orient. Exsic. anno* 1866, ex exemplis floriferis visis non possum segregare.

19. C. UMBROSUM, *Steven in Mém. Mosc.* vii. 68, t. 14; *Kunth, Enum.* iv. 143; *Led. Flor. Ross.* iv. 204.—C. arenarium, var. umbrosum, *Ker in Bot. Reg.* t. 541.—C. autumnale, var., *M. Bieb. Flor. Taur. Cauc.* iii. 181. Cormus parvus ovoideus, tunicis atrofuscis 2–3 poll. supra collum productis. Folia 4–5 hysteranthia suberecta lorata 6–9 poll. longa medio 9–12

lin. lata, e medio ad apicem obtusum angustata. Flores 1–5 autumnales. Perianthii tubus 2–3-pollicaris; limbus lilacinus haud tessellatus 9–12 lin. longus, segmentis oblanceolatis obtusis 1½–3 lin. latis venis 8–12 percursis. Stamina limbo 2–4plo breviora, antheris luteis 1½ lin. longis. Styli stamina superantes vel æquilongi apice stigmatoso subcapitato leviter curvato. *Tauria*, M. Bieberstein, Steven. *Caucasus*, Ledebour!

20. C. NEAPOLITANUM, *Tenore, Neap.* v. 11, t. 221. f. 2; *Kunth, Enum.* iv. 142; *Parl. Fl. Ital.* iii. 182.—C. arenarium. *Gren. et Godr. Fl. France,* iii. 171, *non W. & K.*—C. longifolium, *Cast. Cat. Mars.* 135.—C. castrense, *Laram. in Bull. Soc. Bot. France,* ii. 688.—C. provinciale, *Loret in Bull. Soc. Bot. France,* vi. 459.—C. Haynaldi, *Heuff. teste Borbas in Œster. Bot. Zeitsch.* 1876, 182.—C. Jankæ, *Freyn. in Œster. Bot. Zeitsch.* 1877, 361. Cormus globosus 1 poll. crassus, tunicis brunneis supra collum 1½–2 poll. productis. Folia 3–4 hysteranthia vernalia recurvata patentia ligulata 8–12 poll. longa, medio 6–9 lin. lata obtusa canaliculata e medio ad basin attenuata, marginibus haud undulatis. Flores autumnales 1–2 raro 3–4 ad spatham. Perianthii tubus 3–4-pollicaris; limbus lilacino-purpureus haud tessellatus 15–18 lin. longus, segmentis oblanceolatis obtusis 3–6 lin. latis, venis 15–18 percursis, interioribus angustioribus. Stamina limbo subduplo breviora, antheris luteis 3 lin. longis. Styli stamina superantes, stigmatibus 1½ lin. longis distincte falcatis. Capsulæ solitariæ ovoideo-oblongæ 9–12 lin. longæ, carpellorum rostris incurvatis. *Italia, Gallia meridionalis, Austria, Dalmatia, Mauritania?* C. KOCHII, *Parl. Fl. Ital.* iii. 118 (C. arenarium, *Koch, Syn.* 836), C. ORIENTALE, *Friv.*; *Kunth, Enum.* iv. 143, et C. ÆTNENSE, *Tineo in Guss. Syn. Sic.* ii. 818, ex descriptione non possum segregare.

21. C. PARNASSICUM, *Sart. Orph. et Held. in Boiss. Diagn.* ser. 2, No. iv. 122. Cormus magnitudine mediocri (1 poll. crassus), tunicis castaneis membranaceis 2–3 poll. supra collum productis. Folia 4–5 hysteranthia vernalia lingulata obtusa. Flores æstivales 1–3 ad spatham. Perianthii tubus 2–3-pollicaris; limbus lilacino-purpureus haud tessellatus 12–18 lin. longus, segmentis oblanceolatis obtusis 3–5 lin. latis venis 10–15 percursis. Filamenta 3–6 lin. longa, antheris luteis 3 lin. longis. Styli stamina superantes apice stigmatoso unilaterali distincte falcati. *In montibus Græciæ Chelmos, Parnassus, &c. alt.* 5000–7000 *pedes,* Orphanides, 465! etc. Ad *C. neapolitanum* arcte accedit.

22. C. CORSICUM, *Baker.* Cormus globosus 6–9 lin. crassus, tunicis brunneis 1–2 poll. supra collum productis. Folia 4 hysteranthia suberecta vel patula lanceolata 2–3 poll. longa supra basin 3–4 lin. lata ad apicem obtusum angustata. Flores autumnales solitarii. Perianthii tubus filiformis 3–4-pollicaris; limbus lilacinus haud tessellatus 8–10 lin. longus, segmentis oblanceolatis obtusis 1½–2 lin. latis, venis 8–12 percursis. Stamina limbo 2–4plo breviora, antheris oblongis luteis 1 lin. longis. Styli

vix ex tubo protrusi apice distincte falcati. Capsulæ oblongæ 6–8 lin. longæ, carpellis breviter rostratis. *Corsica in incultis ad Bonifacio*, Serafino!

23. C. ARENARIUM, *Waldst. et Kit. Hung.* ii. 195, t. 179! *Steven in Act. Nov. Mosc.* vii. 263; *Kunth, Enum.* iv. 143; *Reich. Ic. Fl. Germ.* figs. 944, 945, *non Koch nec Gren. & Godr.* Cormus globosus 8–9 lin. crassus, tunicis brunneis 2–3 poll. supra collum productis. Folia 3–4 hysteranthia vernalia suberecta ligulata obtusa canaliculata 3–4 poll. longa, 3–4 lin. lata. Flores autumnales 1 vel interdum 2–3 ad spatham. Perianthii tubus 3–4-pollicaris; limbus lilacinus haud tessellatus 12–18 lin. longus, segmentis oblanceolatis obtusis 3–4 lin. latis, venis 8–12 percursis. Filamenta 3–6 lin. longa, antheris luteis oblongis 2–3 lin. longis. Styli stamina superantes, apice stigmatoso recti subcapitati. Capsulæ oblongæ 8–9 lin. longæ, carpellis breviter mucronatis. *Hungaria, in arenosis siccis*, Sadler & Pauer! Fenzl! Janka! etc. Exempla florifera ab *Byzantio* Aucher-Eloy 2155! et *Cephalonia*, Schimper & Wiest! non possum segregare.

24. C. ALPINUM, *DC. Fl. France*, ii. 195; *Gaud. Helv.* ii. 601; *Kunth, Enum.* iv. 142; *Gren. Fl. France*, iii. 171; *Reich. Ic. Fl. Germ.* figs. 946–948; *Parl. Fl. Ital.* iii. 184.—C. montanum, *All. Ped.* i. 117, tab. 74. fig. 2. Cormus ovoideus 6–9 lin. crassus, tunicis membranaceis pallide brunneis 1–2 poll. supra collum productis. Folia 2 raro 3 hysteranthia vernalia lingulata suberecta vel patula 4–8 poll. longa medio 3–6 lin. lata obtusa canaliculata lucide viridia e medio ad basin sensim attenuata. Flores solitarii raro bini æstivales. Perianthii tubus gracilis 3–4-pollicaris; limbus lilacinus haud tessellatus 13–15 lin. longus, segmentis oblanceolatis obtusis 3–4 lin. latis, venis 10–15 percursis. Stamina limbo 3–4plo breviora, antheris luteis oblongis 1½–2 lin. longis. Styli staminibus sæpe breviores, apice stigmatoso subcapitati vix recurvati. Capsula oblonga subpollicaris. *Montes Galliæ australis orientalis, Helvetiæ, et Sabaudiæ in pratis subalpinis.*

Var. C. PARVULUM, *Tenore, Fl. Nap.* iii. 339, tab. 221. fig. 2; *Kunth, Enum.* iv. 143; *Gren. Fl. France*, 171; *Parl. Fl. Ital.* 186, ab typo vix recedit nisi floribus minoribus, foliis angustioribus. *Montes Italiæ australis, Siciliæ et Corsicæ.*

25. C. LINGULATUM, *Boiss. & Spruner in Boiss. Diagn.* v. 66; *Walp. Ann.* i. 874. Cormus oblongus nucis *Avellanæ* magnitudine, tunicis nigris vestitus. Folia 4–6 hysteranthia patula lingulata obtusa rigidiuscula glauca sesquipollicaria 5–6 lin. lata angustissime cartilagineo-marginata. Flores vernales solitarii. Perianthii tubus subpollicaris; limbus lilacinus haud tessellatus, segmentis linearibus acutis vix 1½ lin. latis. Filamenta brevissima, antheris luteis oblongis. Styli filiformis limbo parum breviores.

Capsulæ parvæ, carpellis mucronatis. *In regione superiore montis Parnes, Atticæ,* Boissier & Spruner.

26. C. MONTANUM, *Linn. Sp.* 485 (*quoad plantam Hispanicam in herbario suo Lœflingio lectam!*); *Desf. Fl. Atlant.* i. 322; *Reich. Ic. Fl. Germ.* t. 940–943; *Vis. Fl. Dalm.* 54, tab. 6. fig. 1.—C. hermodactylum, *Parkins. Parad.* 155. fig. 6, 157.—C. bulbocodioides, *M.B.Flor.Taur.Cauc.* i. 293, iii. 281; *Kunth, Enum.* iv. 144; *Willk. et Lange, Fl. Hisp.* i. 194, *non Brotero.*—C. Bertolonii, *Stev. in Act. Mosq.* vii. 268; *Kunth, Enum.* iv. 143; *Parl. Fl. Ital.* iii. 190.—C. Cupani, *Guss. Fl. Sic.* i. 452.—C. Valery, *Tineo in Guss. Syn. Fl. Sic.* ii. 818.—C. parviflorum, *Biv. in Biv. fil. Piant. inedit.* 9.—C. pusillum, *Sieber in Bot. Zeit.* 1822, 248?—C. Ritchii, *R. Br. App. Denh. et Clapp.* 241!—C. ægyptiacum, *Bois. Diagn.* v. 66.—C. hololophum, *Coss. et Durieu in Balans. Pl. Alger. Exsic.* No. 945.—C. nivale, *Boiss. & Huet in Huet Pl. Arm. Exsic.*—C. triphyllum, *Kunze in Bot. Zeit.* 1846, 755.—C. crocifolium, *Boiss. Diagn.* v. 67, *non Sims.*—C. crociflorum, *Schott & Kotschy in Œster. Bot. Wochen.* 1854, 97.—Fouha bulbocodioides, *Pomel, Mat. Fl. Alg.* 2. Cormus ovoideus 1–1½ poll. crassus, tunicis brunneis membranaceis, interioribus supra collum 2–4 vel interdum 5–6 poll. productis. Folia 2–3 raro 4–6 synanthia linearia vel lanceolata tempore florendi falcata suberecta 2–3 poll. longa, demum 6–9 poll. longa, medio 6–9 lin. lata, marginibus anguste cartilagineis, interdum ciliatis. Flores 1–4 vernales vel hiemales (Oct.–Jun.). Perianthii tubus gracilis 3–4-pollicaris; limbus lilacinus haud tessellatus 9–12 lin. longus, segmentis oblongis obtusis vel oblanceolatis subacutis medio 2–4 lin. latis, venis 8–20 percursis. Stamina limbo subduplo breviora, filamentis basi luteis incrassatis, antheris oblongis purpureis 1–1½ lin. longis. Styli stamina sæpe superantes, apice stigmatoso recti subcapitati. Capsulæ 6–9 lin. longæ. *Per regionem totam Meriditerraneam a Lusitania ad Caucasum, Armeniam, Kurdistan, et Persiam.* Stirps valde variabilis. C. CROCIFOLIUM, *Boiss.*, est forma longicollis, floribus pluribus, perianthii segmentis subacutis; C. NIVALE, *Boiss. et Huet,* forma nana nivalis uniflora Armeniaca, perianthii segmentis ellipticis obtusis; C. CUPANI, *Guss.*, forma nana pauciflora parviflora foliis linearibus; C. MINIMUM, *hort. Elwes,* ab insula Syra, forma uniflora, flore minimo, segmentis oblanceolatis obtusis 5–6 lin. longis; C. VALERY, *Tineo,* forma foliis lanceolatis, floribus pluribus, perianthii segmentis ellipticis; C. RITCHII, *R. Br.* (cf. *Aschers. in Bot. Zeit.* 1878, 434), forma filamentis basi cristatis; et C. FASCICULARE, *R. Br.*! (Hypoxis fascicularis, *Linn. Sp.* 439; Monocaryum fasciculare, *Schult. Syst. Veg.* vii. 1135; *Kunth, Enum.* iv. 150; Paludaria, *Salisb. Gen.* 53), forma abnormalis ovario uniloculari, stylo unico.

27. C. STEVENI, *Kunth, Enum.* iv. 144 (*excl. syn. Desf. &c.*). Cormus anguste ovoideus 6–9 lin. crassus, tunicis atro-castaneis duris supra collum longe productis. Folia 3–4 synanthia, tempore florendi linearia suberecta

2–3 poll. longa, demum ligulata 4–5 poll. longa medio 3–4 lin. lata canaliculata, marginibus anguste cartilagineis. Flores 1–4 hiemales (Oct.–Jan.), tubo gracili 3–4-pollicari, limbi pollicaris roseo-lilacini haud tessellati segmentis oblanceolatis subobtusis 2–3 lin. latis venis 8–10 laxis percursis. Stamina limbo 2–3plo breviora, filamentis basi vix incrassatis, antheris linearibus luteis 1½–2 lin. longis. Styli stamina superantes vel æquilongi apice stigmatoso recti subcapitati. Capsulæ pro genere minimæ. *Syria*, Blanche, Rel. Maill. 1767! Hooker & Hanbury! Haussknecht! etc. *Arabia felix*, Schimper 870! *Persia*, Olivier.

28. C. Szovitsii, *C. A. Meyer, Ind. Sem. Petrop.* 1834, 34; *Kunth, Enum.* iv. 145. Cormus ovoideus 1½ poll. crassus, tunicis exterioribus castaneis chartaceis, interioribus supra collum longe productis. Folia 3 synanthia vernalia, tempore florendi lanceolata suberecta falcata 2–3 poll. longa deorsum 1 poll. lata, demum subpedalia basi angustata. Flores 1–2 vernales. Perianthii tubus 2–4-pollicaris, foliorum basibus occultus; limbus lilacinus haud tessellatus 1–1½-pollicaris, segmentis oblongis medio 3–6 lin. latis, venis circiter 20 percursis. Stamina biseriata limbo duplo breviora, antheris linearibus luteis 3 lin. longis. Styli stamina superantes apice stigmatoso recti capitati. Capsulæ ovoideæ 1–1½ poll. longæ, carpellis apice longe rostratis. *In montibus Armeniæ*, Szovits! *Kurdistan*, Garden! Ab *C. montano* recedit habitu robustiore, antheris flavis linearibus, foliis adultis majoribus, capsulis multo majoribus.

29. C. luteum, *Baker in Gard. Chron.* 1874, 33; *Hook. fil. in Bot. Mag.* t. 6153. Cormus ovoideus 9–12 lin. crassus, tunicis brunneis, interioribus supra collum longe productis. Folia 2–3 raro 4–6 synanthia vernalia ligulata tempore florendi 2–3 poll. demum 6–12 poll. longa, medio 4–6 lin. lata obtusa e medio ad basin attenuata. Flores 1–2 vernales (Dec.–Jun.). Perianthii tubus 3–4-pollicaris; limbus luteus 1–1½ poll. longus haud tessellatus, segmentis oblanceolatis obtusis 2–3 lin. latis, venis 12–20 crebris percursis. Stamina limbo paulo breviora, antheris linearibus basifixis 4–6 lin. longis, filamentis multo brevioribus filiformibus haud incrassatis. Styli lutei stamina sæpe superantes, apice stigmatoso recti capitati. Capsulæ 1–1½ poll. longæ, valvis apice recurvatis longe rostratis. *Himalayæ occidentalis regio temperata*, Thomson! Aitchison 1125! Henderson! *Afghanistan*, Griffith 5895! *Beloochistan*, Stocks 1080!

Species mihi nomine tantum notæ.

C. Boissieri, *Orphan. in Atti Congres. Intern. Firenze*, 1847, 27.

C. eubœum, *Orphan. loc. cit.*

C. Parlatoris, *Orphan. loc. cit.*

C. polymorphum, *Orphan. loc. cit.*

10. Wurmbea, *Thunb.*

Thunb. Nov. Gen. 18; *Schlecht. in Linnæa*, i. 82; *Kunth, Enum.* iv. 159; *Endl. Gen.* No. 1075; *Benth. Fl. Austral.* vii. 27.—Melanthii sp., *Burm., Linn. fil. etc.*

Perianthium firmum, persistens, gamophyllum, tubo campanulato, infundibulari vel cylindrico, segmentis 6 raro 8 lanceolatis vel linearibus æqualibus facie supra basin foveolatis sæpissime tubo longioribus. *Stamina* 6, raro 8, ad faucem tubi inserta, filamentis filiformibus perianthii segmentis brevioribus, antheris minutis oblongis versatilibus dorsifixis extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile triloculare, ovulis in loculo pluribus superpositis; carpellis in stylos breves falcatos sensim attenuatis apice stigmatosos. *Capsula* globosa, septicide trivalvis, stylis persistentibus coronata, seminibus globosis, testa brunnea membranacea, albumine firmo, embryone minuto. *Herbæ firmæ glabræ erectæ, bulbo membranaceo-tunicato præditæ, caulibus foliis paucis segregatis linearibus vel lanceolatis præditis, superioribus sensim minoribus, floribus spicatis ebracteatis pallidis vel purpureis.* Ab *Anguillaria* solum perianthii segmentis basi coalitis recedit.

Perianthium tubo distincto campanulato vel cylindrico præditum.
  Africana .... 1. *W. campanulata.*
  Australienses............ 2. *W. tubulosa.*   3. *W. Drummondii.*
Perianthii segmentis basi solum coalitis.
  Africanæ .... 4. *W. tenuis.*   5. *W. Kraussii.*
  Australienses .... 6. *W. tenella.*   7. *W. pygmæa.*

1. W. campanulata, *Willd. Sp. Plant.* ii. 265; *Lam. Ill.* t. 270; *Kunth, Enum.* iv. 159.—Melanthium monopetalum, *Linn. fil. Suppl.* 213; *Bot. Mag.* t. 1291.—M. spicatum, *Burm. Fl. Cap.* 11.—M. Wurmbeum, *Thunb. Prodr.* 67; *Fl. Cap.* 338. Herba glabra erecta semipedalis vel pedalis, bulbo ovoideo longicollo, tunicis brunneis. Folia 3–4 firma, inferiora linearia 3–9 poll. longa, superiora lanceolata basi dilatata, caulem amplectentia. Spica 1–3 poll. longa laxiflora vel densiflora, rachi parum flexuosa. Perianthium pallidum 4–6 lin. longum, tubo campanulato 1½–2 poll. longo, segmentis lanceolatis acutis supra basin glandula nigra perspicua foveolatis. Filamenta 1½–2 lin. longa. Fructus globosus 2 lin. longus, stylis divaricatis 1½ lin. longis coronatus. *C. B. Spei in humidis, ad* 6000 *pedes ad montem Katberg ascendens,* Drège 3512! MacOwan 979! etc. Melanthium remotum, *Soland. MSS.* !, est forma mera laxiflora; W. purpurea, *Dryand. in Ait. Hort. Kew.* edit. 2, ii. 326 (*Andr. Bot.*

Rep. t. 221; *Ker in Bot. Mag.* t. 694), est forma floribus luride purpureis, segmentis tubo campanulato æquilongis vel longioribus; M. REVOLUTUM, *Soland. MSS.*!, ab *purpurea* solum recedit segmentis patulis vel revolutis; M. MARGINATUM, *Desr. in Lam. Encyc.* iv. 29, est forma segmentis pallidis nigro-marginatis; W. TRUNCATA, *Schlecht.*, *Kunth, Enum.* iv. 161 (*Zeyher* 1722!), est forma laxiflora, foliis linearibus, segmentis angustis stellato-patentibus tubo longioribus, tubo inter lacinias truncato. Flores raro tetrameri.

Var. W. LONGIFLORA, *Willd. Sp. Plant.* ii. 266; *Kunth, Enum.* iv. 161.—Melanthium tubiflorum, *Soland. MSS.*! Varietas robusta, floribus majoribus pallidis (9–12 lin. longis), tubo cylindrico 4–6 lin. longo, segmentis tubo æquilongis vel brevioribus. *C. B Spei*, Drège 2660 *b*! Zeyher! Mader 183! M. INUSTUM, *Soland. MSS.*! (Harvey 879!), est forma humilis, perianthio 4 lin. longo, segmentis brunneis tubo cylindrico duplo brevioribus, staminibus limbo æquilongis; M. PUMILUM, *Ker in Bot. Mag.* sub t. 694! est forma pollicaris, foliis linearibus, spica 3–4-flora, perianthio 3 lin. longo, segmentis linearibus brunneis tubo brevioribus; var. LATIFOLIA, *Baker* (Burchell 6628!), est forma robusta, foliis lanceolatis basi cordatis 12–15 lin. latis, floribus 6–7 lin. longis, tubo pallido infundibulari 2–4 lin. longo, segmentis purpureo-brunneis.

2. W. TUBULOSA, *Benth. Fl. Austral.* vii. 28. Bulbus et folia infima ignota. Folia superiora late lanceolata acuminata. Spica densa circiter 10-flora. Perianthium 7–9 lin. longum, segmentis acutis tubo cylindrico subæquilongis, facie haud foveolatis. Stamina segmentis multo breviora. Ovarium angustum, stylis elongatis. *Australia occidentalis ad Champion Bay*, Herb. F. Mueller.

3. W. DRUMMONDII, *Benth. Fl. Austral.* vii. 28. Bulbus ovoideus 5–6 lin. crassus, tunicis firmis chartaceis atrocastaneis nitidis, collo hypogæo 1–1½ poll. longo. Caulis supra terram 1–2-pollicaris. Folia producta 3–4, omnia lanceolata acuta, infimum 1½–2 poll. longum 5–6 lin. latum, supremum 5–6 lin. longum. Spica 3–8-flora superne densa, inferne laxa. Perianthium pallidum 3–4 lin. longum, tubo campanulato ½–1 lin. longo, segmentis lanceolatis tubo 3–4plo longioribus supra basin brunneo-foveolatis. Stamina segmentis 2–3plo breviora. Styli filiformes ovario æquilongi. *Australia occidentalis in ditione fluminis Cygni*, Drummond!

4. W. TENUIS, *Baker.*—Melanthium tenue, *Hook. fil. in Journ. Linn. Soc.* vii. 229. Herba gracilis erecta 3–4-pollicaris, bulbo ovoideo 3–4 lin. crasso, tunicis brunneis membranaceis. Caulis gracillimus 1–2-pollicaris. Folia producta 2–3, infimum rigidum lineari-subulatum 2–3 poll. longum flores eminens, superiora multo minora basi dilatata. Spica 1–2-flora. Perianthium 3 lin. longum albidum purpureo tinctum, segmentis oblanceolatis basi solum coalitis, supra basin glandula brunnea foveolatis. Stamina

segmentis duplo breviora. Carpella florifera ad antheras attingentia. *Montes insulæ Fernando Po, alt.* 9000 *pedes,* Mann 1454 !

5. W. Kraussii, *Baker.*—Melanthii sp., *Krauss, Beitr.* 165. Bulbus ovoideus, tunicis crassis atro-brunneis supra apicem 2 poll. productis· Caulis gracilis $1\frac{1}{2}$–4-pollicaris. Folia producta 2, infimum lineare vel lineari-subulatum 2 poll. longum, supremum lanceolatum 1–$1\frac{1}{2}$ poll. longum. Spica subdense 5–6-flora. Perianthium pallidum 4 lin. longum, segmentis lanceolatis acutis basi solum coalitis facie vix foveolatis. Stamina segmentis triente breviora, filamentis 2 lin. longis. Ovarium floriferum 2 lin. longum, stylis ovario æquilongis. *Natal,* Krauss 450 Gerrard 549 !

6. W. tenella, *Benth. Fl. Austral.* vii. 28.—Anguillaria tenella, *Endl. in Plant. Preiss.* ii. 45. Bulbus globosus 5–6 lin. crassus, tunicis membranaceis atrocastaneis, collo tunicato $1\frac{1}{2}$–2 poll. longo. Caulis gracillimus filiformis uniflorus 3–4-pollicaris. Folia producta 2–3, infimum subulatum 5–6-pollicare, superiora lanceolata vel linearia acuminata 3–15 lin. longa, basi 1 lin. lata. Perianthium brunneolum 3 lin. longum, segmentis 8 lanceolatis basi solum coalitis, facie media glandula brunnea foveolatis. Stamina segmentis subduplo breviora. Styli 4 floriferi 1 lin. longi. *Australia occidentalis,* Drummond ! Preiss 1598.

7. W. pygmæa, *Benth. Fl. Austral.* vii. 28.—Anguillaria pygmæa, *Endl. in Pl. Preiss.* ii. 45. Bulbus globosus 5–6 lin. crassus, tunicis membranaceis opacis nigro-castaneis, collo hypogæo 1–2 poll. longo. Caulis supra terram 1–2-pollicaris. Folia producta 2 erecta linearia acuminata, infimum 3–4 poll. longum, 1–2 lin. latum, supremum $1\frac{1}{2}$–2 poll. longum. Spica laxa 2–4-flora. Perianthium pallidum 2–3 lin. longum, segmentis lanceolatis brunneo punctatis basi solum coalitis. Stamina segmentis subduplo breviora. *Australia occidentalis in ditione fluminis Cygni,* Drummond ! Preiss 1599.

11. Merendera, *Ramond.*

Ramond in Bull. Phil. 1798, No. 43, t. 12 ; *Schult. fil. Syst.* No. 1533 ; *Kunth, Enum.* iv. 148 ; *Endlich. Gen.* No. 1085 *a.*—Colchici et Bulbocodii sp. *auct.*

Perianthium corollinum infundibulare 6-partitum, segmentis lanceolatis longe unguiculatis, unguibus filiformibus diu connivientibus. *Stamina* 6 inclusa ad basin laminarum inserta, filamentis filiformibus, antheris bilocularibus extrorsis oblongis versatilibus vel linearibus basifixis. *Ovarium* triloculare, ovulis in loculo crebris superpositis, stylis liberis filiformibus apice s

toso rectis capitatis: *Capsula* oblonga ex apice septicide trivalvis, seminibus pluribus turgidis, testa brunnea rugulosa ad hilum appendiculata, albumine duro, embryone centrali cylindrico. *Herbæ bulbosæ acaules habitu omnino* Colchici, *foliis sæpissime synanthiis, cormis novis sæpe sessilibus interdum ad apicem sobolis egredientibus.* Ab *Bulbocodio* solum recedit stylis tribus discretis.

Antheræ oblongæ versatiles parvæ (1–1½ lin. longæ).
  Cormi novi sessiles.
    1. *M. attica.* 2. *M. caucasica.*
  Cormi novi ad apicem sobolis producti.
    3. *M. sobolifera.* 4. *M. hastulata.*
Antheræ lineares basifixæ majores.
  Parvifloræ.
    5. *M. filifolia.* 6. *M. robusta.*
    7. *M. abyssinica.* 8. *M. persica.*
  Grandiflora .... 9. *M. Bulbocodium.*

1. M. ATTICA, *Boiss. et Sprun. Diagn.* v. 67.—Colchicum atticum, *Spruner*; *Tommas., in Flora,* 1840, 730.—Bulbocodium atticum, *Nyman, Syll.* 379. Cormus ovoideus 6–9 lin. crassus, tunicis pluribus firmis atrofuscis, interioribus 1–2 poll. supra collum productis. Folia 3 linearia synanthia falcata demum 3–4 poll. longa. Flores 1–3 hyemales (Oct.–Dec.) pallide lilacini; segmentorum lamina 9–10 lin. longa medio 1½–2 lin. lata lanceolata acuta, venis 10–15 percursa, interiora basi vix auriculata, unguibus filiformibus 1–1½ poll. longis. Antheræ oblongæ versatiles 1 lin. longæ, filamentis filiformibus 3–4 lin. longis basi incrassatis nectariferis. Styli apice subrecti. Capsulæ oblongæ 6–9 lin. longæ. *In aridis Atticæ,* Von Heldreich, Orphanides 92! *Asia Minor,* Montbret! Aucher-Eloy 2170! et forma affinis, *Persia australis prope nives alpis Kuh-daena,* Kotschy 705! Ab *M. caucasica* vix recedit nisi habitu graciliore, perianthii segmentorum laminis angustioribus acutis interioribus basi vix auriculatis.

2. M. CAUCASICA, *M. Bieb. Fl. Taur. Cauc.* i. 293, iii. 281; *Pl. Ross.* t. 50; *Hook. in Bot. Mag.* t. 3690.—Colchicum caucasicum, *Spreng. Syst.* ii. 143.—Bulbocodium trigynum, *Adam in Web. et Mohr. Beiträge,* i. 49; *Kunth, Enum.* iv. 147; *Led. Ross.* iv. 205, *non Nyman.* Cormus ovoideus 6–9 lin. crassus haud soboliferus, tunicis pluribus firmis atrofuscis, interioribus 1–3 poll. supra collum productis. Folia 2–3 synanthia linearia falcata demum 3–4 poll. longa. Flores 1–2 raro 3–4 vernales pallide lilacini; segmentorum lamina oblanceolata obtusa 9–12 lin. longa 2–4 lin. la[illegible] 10–15 percursa, exteriorum basi auriculata, interiorum exauricu-

lata vel interdum obscure auriculata, unguibus filiformibus 1–2 poll. longis. Antheræ oblongæ versatiles 1–1½ lin. longæ, filamentis filiformibus 3–4 lin. longis basi incrassatis nectariferis. Styli stamina sæpe superantes apice stigmatoso recti. Capsulæ oblongæ 9–12 lin. longæ, carpellis divaricatis conspicue rostratis. *Caucasus, Iberia, Armenia, Kurdistan, Persia borealis.* BULBOCODIUM EICHLERI, *Regel, Descr. Plant. Nov.* vi. 64; *Gartenflora,* 1878, 294, t. 952, in Caucaso orientali Eichlerio lectum, ab typo recedit segmentis interioribus basi distincte auriculatis.

3. M. SOBOLIFERA, *C. A. Meyer, Ind. Sem. Petrop.* 1834, 24; *Kunth, Enum.* iv. 150. Cormus minimus novus ad apicem sobolis crassi tunicati egrediens, tunicis interioribus 1–2 poll. supra collum productis. Folia 3 synanthia linearia patula demum 3–4 poll. longa 3–4 lin. lata. Flores 1–2 vernales pallide lilacini; perianthii segmentorum lamina lanceolata acuta 9–12 lin. longa medio 1½ lin. lata venis 6–10 percursa, basi in unguem attenuata exauriculata; ungues filiformes 1–1½ poll. longi. Antheræ oblongæ 1 lin. longæ versatiles basi profunde sagittatæ, filamentis filiformibus 3–4 lin. longis basi incrassatis nectariferis. Styli apice recti. Capsula oblonga 8–9 lin. longa, valvis apice rostratis. *Persia australis et borealis,* Szovits! Haussknecht! *Asia Minor,* Aucher-Eloy 5368!

4. M. HASTULATA, *Baker.*—Bulbocodium hastulatum, *Frivald. in Regens. Flora,* 1836, 434; *Act. Acad. Hung.* 1837, t. 2.—B. trigynum, *Nyman, Sylloge,* 379, *non Adam.* Cormus minimus novus ad apicem sobolis crassi tunicati egrediens, tunicis supra collum 1–2 poll. productis. Folia synanthia linearia. Flores solitarii pallide lilacini. Perianthii segmenta lanceolata acuta 1 poll. longa medio 1½ lin. lata venis circiter 10 percursa basi acute auriculata; ungues filiformes 1–1½ poll. longi. Stamina distincte biseriata, antheris oblongis versatilibus 1 lin. longis, filamentis filiformibus 3-4 lin. longis basi incrassatis nectariferis. Styli staminibus æquilongi apice recti. Capsulam non vidi. *Rumelia,* Frivaldsky! Ad *M. soboliferam* arcte accedit.

5. M. FILIFOLIA, *Cambess. Enum. Balear.* 147; *Kunth. Enum.* iv. 149; *Lange, Fl. Hisp.* i. 193.—M. linifolia, *Munby, Pl. Alger. Exsic.* No. 60. —Bulbocodium vernum, *Desf. Fl. Atlant.* i. 284, *excl. syn.*—B. balearicum, *Nyman, Sylloge,* 379. Cormus ovoideus 6–9 lin. crassus haud soboliferus, tunicis duris atrofuscis 1–2 poll. supra collum productis. Folia 6–10 anguste linearia paulo post flores emergentia, demum 3–4 poll. longa 1–1½ lin. lata firma falcata canaliculata apice leviter cucullata. Flores solitarii autumnales; perianthii segmentorum laminis lanceolatis acutis roseo-lilacinis 1–1½ poll. longis, medio 3–4 lin. latis venis 10–12 percursis, basi haud auriculatis, unguibus filiformibus laminis æquilongis. Stamina laminis duplo breviora, antheris linearibus luteis basifixis 3–4 lin. longis, filamentis filiformibus æquilongis. Styli antheras superantes, apice stigmatoso recti capitati. Capsulæ vernales 6–12 lin. longæ, pedunculo 1-5

poll. longo præditæ. *Algeria in collibus arenosis,* Balansa 37! 236! Munby 60! etc. *Majorca,* Cambessèdes! Maw!

6. M. ROBUSTA, *Bunge in Reliq. Lehmann.* 339; *Walp. Ann.* vi. 151. Cormus ovoideus 1 poll. crassus haud soboliferus, tunicis numerosis coriaceis exsiccatis atrofuscis. Folia 5–7 vel plura synanthia lanceolata, margine serrulato-scaberrima, exteriora demum semipedalia supra basin pollice dimidio latiora. Flores 2–4 vernales; perianthii segmentorum laminis oblanceolatis obtusis 10 lin. longis 3–4 lin. latis, unguibus filiformibus 21 lin. longis. Antheræ lineares basifixæ 4 lin. longæ, filamentis filiformibus 2 lin. longis. Styli 21 lin. longi, apice recti vix incrassati. Capsula sesquipollicaris, pedunculo 3–4 poll. longo. *In arenosis deserti Asiæ occidentalis centralis,* Lehmann.

7. M. ABYSSINICA, *A. Rich. Fl. Abyss.* ii. 337.—M. Schimperiana, *Hochst. in Schimp. Pl. Abyss.* No. 1126.—M. longispatha, *Hochst. in Schimp. Pl. Abyss.* No. 1167. Cormus ovoideus 6–9 lin. crassus haud soboliferus, tunicis brunneis membranaceis, interioribus 1–2 poll. supra collum productis. Folia 4–5 synanthia linearia acuta suberecta falcata tempore florendi 2–3 poll. longa. Flores 1–2 æstivales; perianthii segmentorum laminis acutis lanceolatis lilacinis 9–12 lin. longis $1\frac{1}{2}$–2 lin. latis, venis 6–8 percursis, basi haud auriculatis, unguibus 1 poll. vel ultra longis foliorum basibus occultis. Stamina laminis duplo breviora, antheris luteis linearibus basifixis 3 lin. longis filamentis filiformibus æquilongis. Styli stamina superantes apice stigmatoso curvati. Capsulam non vidi. *In montanis Abyssiniæ,* Schimper 306! 1126! 1167! Roth 106!

8. M. PERSICA, *Boiss. Diagn.* xiii. 37.—M. Aitchisoni, *Hook. fil. in Bot. Mag.* t. 6012. Cormus ovoideus 9–12 lin. crassus haud soboliferus, tunicis brunneis membranaceis, interioribus 2–5 poll. supra collum productis. Folia 4–10 synanthia linearia acuta primum falcata demum patula 4–8 poll. longa 3–4 lin. lata. Flores 1–4 vernales; perianthii segmentorum laminis lanceolatis acutis pallide lilacinis 9–12 lin. longis 1–$1\frac{1}{2}$ lin. latis venis 8–12 percursis, basi haud auriculatis, unguibus filiformibus laminis 2–3plo longioribus. Stamina laminis duplo breviora, antheris linearibus luteis basifixis 3–4 lin. longis filamento æquilongis. Styli antheras superantes, apice stigmatoso recti vel leviter curvati. Capsulæ oblongæ 9–15 lin. longæ. *Teheran ad pedes montis Totschel,* Kotschy 80. *Afghanistan in pomariis ad Quettah,* Griffith 5898! *India orientalis in ditione Panjab,* Vicary! Aitchison 1224! V. v. in Hort. Kew.

9. M. BULBOCODIUM, *Ramond in Bull. Phil.* No. 47. tab. 12. fig. 2; *Red. Lil.* t. 25; *DC. Fl. Franç.* iii. 196; *Kunth, Enum.* iv. 149; *Gren. Fl. Franc.* iii. 169.—Colchicum montanum, *Linn. Sp.* 485, *quoad syn. Clusii* (*Hisp.* 266, t. 267; *Hist.* i. 201, *cum iconibus*).—Merendera montana, *Lange, Fl. Hisp.* i. 193.—Bulbocodium autumnale, *Lap. Pyr.* 202.

—Colchicum hexapetalum, *Pourr. Chlor. Hisp.* No. 1424.—Geophila pyrenaica, *Bergeret, Pyr.* ii. 184. Cormus ovoideus 6–12 lin. crassus haud soboliferus, tunicis membranaceis brunneis supra collum longe productis. Folia 3 paulo post flores emergentia demum linearia falcata canaliculata 3–4 poll. longa. Flores 1–2 autumnales; perianthii segmentorum laminis lanceolatis subacutis roseo-lilacinis 1–2 poll. longis 3–4 lin. latis venis 10–12 percursis, basi haud auriculatis, unguibus filiformibus 1–2 poll. longis. Stamina perianthio multo breviora, antheris linearibus luteis basifixis 6–9 lin. longis, filamentis filiformibus 3–6 lin. longis. Styli antheras sæpe superantes, apice stigmatoso recti subcapitati. Capsulæ vernales subglobosæ 6–9 lin. longæ glandulis fulvis minutis conspersæ, pedunculo elongato præditæ. *Pyrenææ et montes Hispaniæ* (*Sierra Nevada, etc.*) *in regione alpina.*

Var. BULBOCODIOIDES, *Baker.*—Colchicum bulbocodioides, *Brotero, Lust.* 597; *Phyt. Lust.* 119, t. 50, *non M. B.*—Merendera bulbocodioides, *Steud. Nomenc.* 524; *Kunth, Enum.* iv. 149.—Bulbocodium colchicoides, *Nym. Syll.* 379.—B. Broteri, *Welw. Pl. Lusit. Exsic.* No. 384, ab typo vix recedit nisi habitu robustiore, floribus sæpe majoribus, segmentorum laminis 2–3 poll. longis. *In collibus calcareis Lusitaniæ* (*Serra de Cintra, etc.*), Welwitsch 384! etc.

12. ANDROCYMBIUM, *Willd.*

Willd. in Berl. Mag. ii. 21, t. 2; *Schult. fil. Syst. Veg.* vii. 97 & 1526; *Schlecht. in Linnæa,* i. 81; *Endl. Gen.* No. 1074; *Kunth, Enum.* iv. 153; *Baker in Trimen's Journ.* 1874, 243.—Cymbanthes, *Salisb. in Trans. Hort. Soc.* i. 329; *Gen.* 54.—Erythrostictus, *Schlecht. in Linnæa* i. 90; *Schult. fil. Syst. Veg.* vii. 94 & 1524; *Endl. Gen.* No. 1070; *Kunth, Enum.* iv. 154.—Melanthii sp. *auctt. vett.*

Perianthium corollinum infundibulare 6-partitum, segmentis conformibus persistentibus conspicue unguiculatis, lamina lanceolata vel rhomboidea basi cucullata nectarifera. *Stamina* 6 inclusa vel leviter exserta ad laminarum basin cucullatam inserta, filamentis filiformibus deorsum incrassatis, antheris oblongis bilocularibus extrorsis leviter versatilibus. *Ovarium* triloculare, ovulis in loculo crebris superpositis, stylis liberis apice stigmatosis. *Capsula* oblonga vel globosa chartacea septicide trivalvis, carpellis dorso ventricosis, seminibus globosis, testa membranacea brunnea, albumine firmo. *Herbæ bulbiferæ, bulbi tunicis duris brunneis, collo hypogæo producto, caule epigæo brevi vel nudo, foliis propriis confertis sæpe rosulatis, interioribus corymbum amplectentibus, re-*

liquis interdum difformibus pallidis pulchre striatis, floribus corymbosis raro solitariis albidis viridibus vel purpurascentibus.

Folia interiora ovata albida pulchre striata.
1. *A. melanthioides.* 2. *A. subulatum.*
Folia interiora ovata subscariosa haud striata.
Caulis supra terram productus. Folia segregata.
3. *A. Dregei.*
Caulis supra terram nullus. Folia congesta.
Folia apice circinata.
4. *A. volutare.* 5. *A. circinatum.*
Folia apice recta.
Parviflora.
6. *A. leucanthum.* 7. *A. cuspidatum.*
8. *A. Burchellii.*
Grandiflora. 9. *A. eucomoides.* 10. *A. Burkei.*
Folia interiora reliquis conformia lanceolata acuta.
Capense. 11. *A. longipes.*
Mediterranea. 12. *A. punctatum.* 13. *A. palæstinum.*

1. A. MELANTHIOIDES, *Willd. in Berl. Mag.* ii. 21, t. 2; *Schlecht. in Linnæa,* i. 89; *Kunth, Enum.* iv. 153; *Baker in Trimen's Journ.* 1874, 244. Bulbus subglobosus 6–12 lin. crassus, tunicis exterioribus nigris firmis, collo hypogæo 1–3 poll. longo. Caulis supra terram sæpissime breviter productus (1–4-pollicaris), foliis propriis 3–4 erecto-patentibus lanceolatis 4–8 poll. longis. Folia interiora (bracteæ) 4–9 corymbum occultantia oblonga vel lanceolata 2–3 poll. longa sæpissime acuta albida scariosa venis viridibus vel demum brunneis perspicuis decorata. Corymbus pauciflorus, pedicellis 3–6 lin. longis. Perianthium albidum $4\frac{1}{2}$–6 lin. longum, segmentis rhomboideis acutis ungue quam lamina 2–3plo breviore. Stamina demum exserta, antheris luteis lineari-oblongis $\frac{1}{2}$–1 lin. longis. Pistillum floriferum perianthio æquilongum, stylis 2–3 lin. longis. *C. B. Spei in solo humido,* Zeyher 1712! MacOwan 464! Burke 285! etc. *Transvaal,* Dr. Atherstone!

Var. ACAULE, *Baker.* Forma robusta, caule supra terram haud producto. *In ditione Transvaal prope Pretoriam,* Roe! (Bolus 3042).

Var. A. STRIATUM, *Hochst. in Schimp. Pl. Abyss.* No. 1338; *A. Rich. Fl. Abyss.* ii. 336. Forma gracilis, caule producto, foliis linearibus, bracteis minoribus. *Abyssinia in pratis prope Enschedcap,* Schimper 1338! No. 323 anno 1853!

2. A. SUBULATUM, *Baker in Trimen's Journ.* 1874, 245. Bulbus globosus 5–6 lin. crassus, tunicis exterioribus firmis nigrescentibus, collo hypogæo vix pollicari. Caulis supra terram haud productus. Folia propria

2–3 rosulata subulata ascendentia facie canaliculata 6–8 poll. longa. Folia interiora (bracteæ) 3–6 corymbum occultantia oblonga albida 1½–2½ poll. longa venis crebris perspicuis decorata. Corymbus pauciflorus, pedicellis brevissimis. Perianthium albidum 6–7 lin. longum, segmentis rhomboideis acutis, ungue laminæ æquilongo. Stamina breviter exserta, antheris luteis oblongis ½ lin. longis. Pistillum floriferum perianthio æquilongum. *Africa australis in ditione Transvaal*, Baines!

3. A. Dregei, *Presl, Bot. Bemerk.* 116; *Walp. Ann.* i. 875. Cormus subglobosus 2½–3 lin. crassus, tunicis exterioribus atro-fuscis duris, collo hypogæo 1½–2 poll. longo. Caulis supra terram 6–12 lin. longus filiformis, foliis 4–5 linearibus graminoideis 1–4 poll. longis basi 1 lin. latis. Folia interiora minuta lanceolata basi dilatata. Corymbus 1–2-florus. Perianthium viridulum 4 lin. longum, segmentorum lamina rhomboidea acuta, ungue quam lamina 2–3plo breviore. Stamina inclusa, antheris minutis. *C. B. Spei*, Drège 2705!

4. A. volutare, *Burchell, Trav.* i. 213. Bulbum non vidi; collum hypogæum 1½–2 poll. longum. Caulis supra terram haud productus. Folia propria 2 rosulata lanceolata 2–4 poll. longa deorsum 6–9 lin. lata e basi ad apicem acuminatum circinatum sensim attenuata. Folia interiora pauca ovata navicularia corymbum occultantia haud striata obtusa vel subacuta 1¼–2 poll. longa. Corymbus pauciflorus, pedicellis brevissimis. Perianthium albidum 6 lin. longum, segmentorum lamina rhomboideo-lanceolata, ungue filiformi laminæ æquilongo. Stamina breviter exserta, antheris lineari-oblongis 1½ lin. longis. Capsula subglobosa, carpellis persistentibus uncinatis 3 lin. longis. *C. B. Spei in ditione centrali deserto*, Burchell 1215! 1400!

5. A. circinatum, *Baker*. Bulbus parvus, caulibus pluribus cæspitosis hypogæis 2–5 poll. longis. Caulis supra terram haud productus. Folia propria linearia rosulata canaliculata 2–3 poll. longa deorsum 2–3 lin. lata apice acuminata circinata. Folia interiora ovata corymbum occultantia inconspicue brunneo striata 1–2 poll. longa obtusa vel apice herbaceo producto prædita. Corymbus pauciflorus, pedicellis brevissimis. Perianthium 6–7 lin. longum, segmentorum lamina lanceolata, ungue applanato laminæ æquilongo. Stamina laminæ æquilonga, antheris 2 lin. longis. Pistillum floriferum perianthio æquilongum, stylis 3 lin. longis. *C. B. Spei*, Drège 2706!

6. A. leucanthum, *Willd. in Berl. Mag.* ii. 21; *Schlecht. in Linnæa*, i. 87; *Kunth, Enum.* iv. 153; *Baker in Trimen's Journ.* 1873, 245.—A. eucomoides, *Sweet, Brit. Flow. Gard.* t. 165, *non Willd.*—Melanthium capense, *Thunb. Prodr.* 67; *Fl. Cap.* 338.—Anguillaria capensis, *Spreng. Syst.* ii. 146.—Androcymbium punctatum, *Baker in Gard. Chron.* 1874, 786. Bulbus ovoideus 6–9 lin. crassus, tunicis exterioribus duris nigrescentibus, collo hypogæo 2–3 poll. longo. Caulis supra terram nullus vel brevissimus. Folia vetustate purpureo punctata, propria 2–3 ovata vel

lanceolata acuta 4–6 raro 8–9 poll. longa supra basin 1–1½ poll. lata, interiora 2–4 ovata acuta 1–3 poll. longa haud striata. Corymbus pauciflorus vel multiflorus, pedicellis crassis 3–6 lin. longis. Perianthium albidum 6–8 lin. longum, segmentorum lamina rhomboideo-lanceolata, ungue laminæ æquilongo. Stamina laminis æquilonga, antheris luteis 1 lin. longis. Carpella coriacea ventricosa in stylos sensim attenuata. *C. B. Spei*, Sieber 125, Burchell 5628! Zeyher 122! 1720! Drège 2709! Harvey 101! etc. *Basuta-land*, Cooper 3311!

7. A. CUSPIDATUM, *Baker in Trimen's Journ.* 1874, 245. Bulbum non vidi; collum hypogæum 1½–2 poll. longum. Caulis supra terram haud productus. Folia propria 1–2 rosulata lanceolata patula acuta 2–3 poll. longa, interiora 3–4 corymbum occultantia, extima ovato-lanceolata e basi ad apicem sensim attenuata, intima scariosa 9–12 lin. longa haud striata ad apicem cuspidatum herbaceum late rotundata. Corymbus pauciflorus, pedicellis brevissimis. Perianthium viridulum 8–9 lin. longum, segmentorum lamina lanceolata, ungue applanato lamina æquilongo. Stamina laminæ æquilonga, antheris lineari-oblongis flavis 1½–2 lin. longis. Pistillum floriferum perianthio æquilongum, stylis 4 lin. longis. *C. B. Spei, ad ripas fluminis Reed,* Burchell 1376!

8. A. BURCHELLII, *Baker in Trimen's Journ.* 1874, 246. Bulbum non vidi; collo hypogæo 1½–2 poll. longo. Caulis supra terram haud productus. Folia propria 2 rosulata patula ovato-lanceolata obtusa 2½–3 poll. longa supra basin 12–15 lin. lata. Folia interiora 2 corymbum occultantia subrotunda obtusa 12–15 lin. longa haud striata. Corymbus pauciflorus, pedicellis brevissimis. Perianthium viridulum 7–8 lin. longum, segmentorum lamina lanceolato-deltoidea, ungue applanato quam lamina paulo longiore. Stamina distincte exserta, antheris lineari-oblongis 2 lin. longis. *C. B. Spei, in ditione deserti centralis,* Burchell 1401!

9. A. EUCOMOIDES, *Willd. in Berl. Mag.* ii. 21; *Schlecht. in Linnæa,* i. 89; *Kunth, Enum.* iv. 153; *Baker in Trimen's Journ.* 1874, 245.—Melanthium eucomoides, *Jacq. Ic.* ii. 22, t. 452; *Bot. Mag.* t. 641.—Cymbanthes fœtida, *Salisb. in Trans. Hort. Soc.* i. 329. Bulbus globosus 9–12 lin. crassus, tunicis exterioribus duris atro-fuscis, collo hypogæo 2–3 poll. longo. Caulis supra terram nullus. Folia propria 2–4 lanceolata acuta interdum pedalia, supra basin 2–3 poll. lata. Folia interiora 2–4 ovata acuta haud striata 2–4 poll. longa. Corymbus multiflorus, pedicellis crassis 6–12 lin. longis. Perianthium viridulum 9–15 lin. longum, segmentorum lamina rhomboideo-lanceolata, ungue applanato laminæ æquilongo. Stamina breviter exserta, antheris lineari-oblongis 2–3 lin. longis. Capsula subglobosa pollicaris, carpellis ventricosis, stylis persistentibus 5–6 lin. longis. *C. B. Spei,* Burchell 1339! 1395! Drège 2710! etc.

10. A. BURKEI, *Baker in Trimen's Journ.* 1874, 246. Bulbum non

vidi. Caulis supra terram haud productus. Folia exteriora 4–5 lineari-lorata erecta firma distincte costata 8–12 poll. longa supra basin 6–9 lin. lata ad apicem acutum sensim attenuata. Folia interiora plura ovata scariosa haud striata cuspidata 1½–2 poll. longa. Corymbus pauciflorus, pedicellis brevissimis. Perianthium 12–13 lin. longum, segmentorum lamina lanceolata, ungue laminæ æquilongo. Stamina inclusa, antheris ½ lin. longis. Capsula oblonga, stylis 5–6 lin. longis. *C. B. Spei ad ripas fluminis Vaal,* Burke !

11. A. LONGIPES, *Baker in Trimen's Journ.* 1874, 246. Bulbus globosus 6–8 lin. crassus, collo hypogæo 2 poll. longo. Caulis supra terram haud productus. Folia propria 4–5 rosulata lanceolata patula 6–9 poll. longa supra basin 8–10 lin. lata e basi ad apicem acuminatum sensim attenuata. Folia interiora exterioribus conformia sed multo minora haud striata. Corymbus pauciflorus, pedicellis brevissimis. Perianthium 12–15 lin. longum, segmentorum lamina lanceolato-deltoidea, ungue lineari quam lamina duplo longiore. Stamina inclusa, antheris oblongis ½ lin. longis. Pistillum floriferum inclusum, stylis 4 lin. longis. *C. B. Spei in ditione Somerset,* Bowker !

12. A. PUNCTATUM, *Baker.*—Melanthium punctatum, *Cav. Anal. Cienc. Nat.* iii. 49, t. 26. fig. 1 ; *Ic.* vi. 64, t. 588. fig. 1.—M. gramineum, *Cav. Anal. l. c.*; *Ic.* vi. 64, t. 587. fig. 1.—M. angustifolium, *Willd. in Berl. Mag.* ii. 23.—Erythrostictus punctatus *et* gramineus, *Schlecht. in Linnæa,* i. 90 ; *Kunth, Enum.* iv. 154–155.—E. europæus, *Lange Fl. Hisp.* i. 192. Bulbus ovoideus 6–9 lin. crassus, tunicis exterioribus firmis brunneis, collo hypogæo 2·5 poll. longo. Caulis supra terram haud productus, foliis 6–10 dense rosulatis lanceolatis acuminatis firmis ascendentibus 4–6 poll. longis, interioribus reliquis conformibus, basi interdum 9–12 lin. latis. Corymbus multiflorus, pedicellis brevissimis. Perianthium pollicare lilacinum, segmentorum lamina oblonga 2 lin. lata venis 6–8 percursa, ungue laminæ æquilongo. Stamina inclusa, filamentis 3 lin. longis, antheris oblongis 1 lin. longis. Capsulæ chartaceæ oblongo-globosæ ventricosæ 8–9 lin. longæ, stylis persistentibus 3–4 lin. longis. *Mauritania prope Mogadore etc.,* Hooker & Ball ! Herb. Cosson ! Blackmore ! *Algeria,* Kralik ! *Hispania meridionalis prope Almeriam,* Lange 141 !—M. GRAMINEUM, *Cav.* (M. angustifolium, *Willd.*), est forma mera foliis linearibus. Floratio vernalis.

13. A. PALÆSTINUM, *Baker.*—Erythrostictus palæstinus, *Boiss. MSS.* Bulbus ovoideus 6–9 lin. crassus, tunicis exterioribus firmis nigrescentibus, collo hypogæo 1½–2 poll. longo. Caulis supra terram nullus vel brevissimus, foliis 6–10 rosulatis ascendentibus linearibus vel lanceolatis acuminatis 2–3 poll. longis, interioribus reliquis conformibus, basi 4–8 lin. latis. Corymbus pauciflorus, pedicellis brevissimis. Perianthium lilacinum 8–9 lin. longum, segmentorum lamina oblongo-lanceolata 2 lin. lata, ungue

quam lamina subduplo breviore. Stamina lamina subduplo breviora, antheris parvis oblongis. Pistillum inclusum, stylis filiformibus ovario longioribus. Capsulam maturam non vidi. *Palæstina prope Hierosolymam*, Dr. Roth! *Jericho,* Lowne! *Engedi,* Hayne! Floratio vernalis.

13. Bæometra, *Salisb.*

Salisb. in Trans. Hort. Soc. i. 333 (nomen); *Gen.* 54; *Kunth, Enum.* iv. 162; *Endl. Gen.* No. 1077.—Kolbea, *Schlecht. in Linnæa,* i. 80.—Jania, *Schultes fil. Syst. Veg.* vii. 98 & 1528.—Tulipæ sp., *Linn.*—Melanthii sp., *Jacq.*

Perianthium firmum infundibulare 6-partitum, segmentis lanceolatis æqualibus caducis distincte unguiculatis, ungue quam lamina duplo breviore. *Stamina* 6 inclusa ad laminarum basin inserta, filamentis subulatis, antheris lineari-oblongis versatilibus dorsifixis extrorsis. *Ovarium* sessile cylindricum triloculare, ovulis in loculo crebris, stylis nullis, stigmatibus tribus minutis uncinatis. *Capsula* coriacea cylindrico-triquetra septicide trivalvis, seminibus perpluribus compressis, testa brunnea membranacea, albumine firmo, embryone minuto.

1. B. columellaris, *Salisb. et Kunth, locc. citt.*—Tulipa Breyniana, *Linn. Sp.* edit. ii. 438.—Melanthium uniflorum, *Jacq. Ic.* ii. 21, t. 450; *Ker in Bot. Mag.* t. 767.—M. æthiopicum, *Thunb. Desr. in Lam. Encyc.* iv. 29.—Kolbea Breyniana, *Schlecht. loc. cit.*—Jania Breyniana, *Schultes fil., loc. cit.* Herba erecta glabra semipedalis vel pedalis. Bulbus globosus 6–9 lin. crassus, tunicis exterioribus membranaceis nigrescentibus. Folia 6–8 firma segregata persistentia falcata linearia sessilia margine ciliata, inferiora 6–9 poll. longa deorsum 3–6 lin. lata, superiora sensim minora. Flores 1–6 laxe spicati. Perianthium 6–9 lin. longum, intus flavum, extus rubellum. Stamina laminis duplo breviora, filamentis basi purpurascentibus. Capsula 12–21 lin. longa, 2–2½ lin. diam. *C. B. Spei,* Masson! Oldenburg! Burchell 6769! Drège 307! Bolus 2836! Mader 184! etc.

14. Dipidax, *Lawson.*

Salisb. in Trans. Hort. Soc. i. 330 (nomen); *Gen.* 54.—Melanthium, *Linn. fil. ex parte*; *Schlecht. in Linnæa,* i. 80; *Schultes fil. Syst. Veg.* vii. No. 1541; *Kunth, Enum.* iv. 155.

Flores hermaphroditi. *Perianthium* 6-partitum caducum, segmentis oblanceolatis æqualibus obscure unguiculatis flore expanso patentibus. *Stamina* 6 perigyna segmentis breviora, filamentis subulatis basi applanatis, antheris minutis oblongis versatilibus dorsifixis extrorsum longitudinaliter dehiscentibus. *Ovarium*

sessile obovoideum triloculare, ovulis in loculo crebris superpositis; styli 3 liberi subulati falcati apice stigmatosi. *Capsula* chartacea obovoidea septicide trivalvis, seminibus globosis, testa brunnea membranacea, albumine firmo, embryone minuto. *Herbæ glabræ caulescentes, bulbo tunicis membranaceis vestito, foliis paucis angustis superpositis, floribus spicatis haud bracteatis.*

Folia plana margine ciliata .... 1. *D. ciliata.*
Folia subulata glabra .... 2. *D. triquetra.*

1. D. CILIATA, *Baker.*—Melanthium ciliatum, *Linn. Suppl.* 213; *Thunb. Prodr.* 67; *Fl. Cap.* 338; *Schlecht. in Linnæa,* i. 83; *Schultes fil. Syst. Veg.* vii. 1544; *Kunth, Enum.* iv. 156.—M. capense, *Willd. Sp.* ii. 267; *Lam. Ill.* t. 269.—Wurmbea purpurea, *Drège, Exsic., non Dryand.* Bulbus globosus 6–9 lin. crassus, tunicis membranaceis atrocastaneis, collo hypogæo 2–3 poll. longo. Caulis 3–12-pollicaris, sursum sæpe puberulus. Folia producta 3 caulem amplectentia firma margine ciliata, inferiora lanceolata vel lineari-lanceolata 2–6 poll. longa deorsum 6–9 lin. lata, supremum multo minus. Flores multi vel pauci dense spicati. Perianthium 3–6 lin. longum, albidum vel rubro tinctum, segmentis oblanceolatis ½–1 lin. latis haud foveolatis, vetustate brunneo-punctatis. Stamina segmentis subduplo breviora, antheris oblongis ½ lin. longis. Ovarium turbinatum acute angulatum, stylis 1–1½ lin. longis. Capsula semipollicaris apice obtusa umbilicata, ad latera apicibus carpellorum sæpe obscure cornuta. *C. B. Spei in pratis et inundatis.*—MELANTHIUM BLANDUM, *Soland. MSS.*, est forma foliis lineari-lanceolatis, floribus paucis parvis secundis.—M. SECUNDUM, *Desr., Kunth, Enum.* iv. 156, est forma similis perianthii segmentis basi utrinque denticulo præditis.—M. BERGII, *Schlecht.*; *Kunth, Enum.* iv. 157, est forma nana foliis linearibus floribus paucis pallidis.—M. GRACILE, *Desr., Kunth, loc. cit.*, est forma gracilis uniflora foliis linearibus; et M. LURIDUM, *Soland. MSS.*, est forma foliis brevibus oblongis floribus densis brunneis.

Var. M. GARNOTIANUM, *Kunth, Enum.* iv. 157. Folia lanceolata. Perianthii segmenta albida, supra unguem brevem foveolis vel maculis duabus nectariferis prædita. *C. B. Spei.*—M. RUBICUNDUM, *Willd., Kunth, Enum. loc. cit.*, ab *Garnotiano* solum recedit perianthii segmentis rubro tinctis.—M. CÆRULEUM, *Ecklon,* est forma similis perianthii segmentis cæruleo tinctis; et M. MARGINATUM, *Schlecht.*, et M. SCHLECTENDALIANUM, *Schultes fil.*, formæ foliis ovato-oblongis perianthii segmentis albis basi maculato-foveolatis.

2. D. TRIQUETRA, *Baker.*—D. rosea, *Salisb. loc. cit.*—Melanthium triquetrum, *Linn. fil. Suppl.* 213; *Thunb. Prodr.* 67; *Fl. Cap.* 340; *Schlecht. in Linnæa,* i. 86; *Schultes fil. Syst. Veg.* vii. 1547; *Kunth, Enum.* iv. 157.—M. junceum, *Jacq. Ic.* ii. 21, t. 451; *Bot. Mag.* t. 558.

Bulbus globosus longicollis, tunicis membranaceis brunneis. Caulis 1–1½-pedalis. Folia 3 superposita glabra subulata, infimum pedale vel ultra, superiora multo minora prope caulis apicem imposita, basi valde dilatata. Spica 1–6-pollicaris superne densa. Perianthium 6 lin. longum, segmentis albis oblanceolatis obtusis 2–3 lin. latis 8–12-nervatis basi maculis duabus nectariferis purpureis præditis. Stamina segmentis subduplo breviora, antheris oblongis purpureis ½ lin. longis. Ovarium parvum oblongum, stylis tribus subulatis falcatis 1 lin. longis. Capsulæ carpella dorso magis rotundata quam in *D. ciliata*. *C. B. Spei in pratis et locis inundatis,* Masson! Bowie! Hort. Kew, anno 1802! etc.

15. Burchardia, *R. Brown.*

R. Brown, Prodr. Fl. Austral. 273; *Endlich. Gen.* No. 1069; *Kunth, Enum.* iv. 164; *Benth. Fl. Austral.* vii. 33.

Perianthium firmum albidum 6-partitum rotatum deciduum, segmentis æqualibus oblanceolato-oblongis flore expanso patulis. *Stamina* 6 hypogyna, filamentis linearibus perianthio brevioribus, antheris oblongis leviter versatilibus prope basin affixis extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile triloculare triquetro-ampullæforme, ovulis in loculo pluribus superpositis, carpellis in stylos breves sensim angustatis, stigmatibus tribus minutis falcatis. *Capsula* coriacea oblongo-triquetra septicide trivalvis, seminibus multis minutis compressis, testa membranacea brunnea, albumine firmo, embryone minuto.

1. B. umbellata, *R. Br. loc. cit.*; *Kunth, Enum.* iv. 164; *Benth. Fl. Austral.* vii. 33.—B. multiflora *et* congesta, *Lindl. Veget. Swan River,* 58. Herba gracilis glabra erecta 1–2-pedalis, cauli basi vix incrassato bulboso foliis scariosis haud productis cincto, fibris radicalibus cylindricis. Folia producta 3–4 segregata, inferiora linearia 6–9 poll. longa, superiora multo minora lanceolata. Caulis sæpissime simplex, interdum furcatus. Flores pauci vel plures in umbellam dispositi, pedicellis strictis 3–30 lin. longis, bracteis firmis linearibus 1½–6 lin. longis, raro majoribus. Perianthium 4–6 lin. longum extus rubro tinctum, segmentis obtusis 1½–2 lin. latis. Filamenta 2 lin. longa. Capsula 5–6 lin. longa. *Tasmania et Australia temperata occidentalis et orientalis.*—B. multiflora, *Lindl.*, est forma robusta occidentalis, caule sæpe furcato, foliis 5–6 inferioribus pedalibus, pedicellis elongatis.

16. Ornithoglossum, *Salisb.*

Salisb. Parad. t. 54; *Gen.* 54; *Schlecht. in Linnæa,* i. 81; *Kunth, Enum.* iv. 163.—Lichtensteinia, *Willd. in Berl. Mag.* ii. 20.—Cymation, *Spreng. Syst.* ii. 142.—Melanthii sp., *Linn.*

Perianthium firmum 6-partitum, segmentis æqualibus linearibus supra unguem foveolatis flore expanso æqualiter vel oblique recurvatis persistentibus. *Stamina* 6 hypogyna, filamentis filiformibus medio leviter incrassatis, antheris oblongis versatilibus dorsifixis extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile obovoideum obtusum triloculare, ovulis in loculo crebris superpositis, stylis tribus elongatis filiformibus apice stigmatosis. *Capsula* chartacea obovoidea obtusa tarde loculicide trivalvis, seminibus globosis, testa crassa carnosa, albumine firmo, embryone minuto.

1. O. GLAUCUM, *Salisb. et Kunth, locc. citt.*—O. viride, *Dryand. in Ait. Hort. Kew.* edit. 2, ii. 327.—Melanthium viride, *Linn. Suppl.* 213; *Thunb. Prodr.* 67; *Andr. Bot. Rep.* t. 233; *Bot. Mag.* t. 994.—Lichtensteinia lævigata, *Willd. loc. cit.*—Cymation lævigatum, *Spreng. loc. cit.* Herba erecta glabra glauca semipedalis vel pedalis, cormo tunica membranacea vestito prædita, collo 2–3 poll. longo. Caulis 3–6-pollicaris, foliis 4–6 præditus, inferioribus crebris lanceolatis acutis 4–6 poll. longis 9–12 lin. latis margine planis, superioribus minoribus lanceolatis. Flores plures cernui suaveolentes in racemum laxum dispositi, pedicellis floriferis patulis, fructiferis deflexis, inferioribus 1–2 poll. longis, bracteis parvis foliaceis linearibus. Perianthium purpureum 4–6 lin. longum, segmentis subregulariter reflexis. Stamina perianthio subduplo breviora. Styli 2–3 lin. longi. Capsula 6–9 lin. longa. *C. B. Spei ab ditione australi, occidentali et orientali ad Transvaal,* Masson! Drège! Chapman & Baines! Burchell 1502! etc.

Var. GRANDIFLORUM, *Baker.* Forma robusta pedalis vel sesquipedalis, foliis latis margine planis, pedicellis reflexis, floribus majoribus segmentis 9–12 lin. longis facie pallidioribus unilateraliter recurvatis, staminibus declinatis perianthio paullo brevioribus, stylis 9–15 lin. longis. *C. B. Spei,* Burchell 1283! 2023! Drège! Zeyher 1724! etc.

Var. MADAGASCARIENSIS, *Baker.* Pedalis vel sesquipedalis, foliis inferioribus linearibus margine planis, racemo laxo pedicellis floriferis et fructiferis ascendentibus, inferioribus 2–2½ poll. longis, floribus parvis atropurpureis, staminibus perianthio triplo brevioribus. *Madagascaria in locis aquosis provinciæ Emirna,* Hilsenberg et Bojer!

Var. UNDULATUM, *Baker.*—Lichtensteinia undulata, *Willd. in Berl. Mag.* ii. 20.—Ornithoglossum undulatum, *Spreng. Cur. Post.* 143; *Sweet, Brit. Flow. Gard.* t. 131.—O. Lichtensteinii, *Schlecht. in Linnæa,* i. 91; *Kunth, Enum.* iv. 163. Semipedalis, foliis lanceolatis margine crispatis, caule brevi, pedicellis inferioribus deflexis, floribus var. *grandiflori. C. B. Spei,* Drège! Zeyher 1721! *Ad ripas fluminis Pamka,* Burke!

Var. ZEYHERI, *Baker.* Forma nana foliis pluribus linearibus congestis valde crispatis, caule obsoleto, floribus parvis corymbosis pedicellis ascendentibus folia haud eminentibus. *C. B. Spei,* Zeyher 1723!

17. Iphigenia, *Kunth.*

Kunth, Enum. iv. 213; *Benth. Fl. Austral.* vii. 30.—Hypoxidopsis, *Steud. in Hohen. Pl. Can.* No. 1313.—Notocles, *Salisb. Gen.* 54.—Anguillariæ et Melanthii sp. *auctt. vett.*

Perianthium 6-partitum, segmentis caducis æqualibus linearibus vel oblanceolatis obscure unguiculatis facie haud foveolatis flore expanso patulis. *Stamina* 6 hypogyna, filamentis leviter applanatis quam segmenta brevioribus, antheris minutis oblongis versatilibus prope basin affixis bilocularibus extrorsum longitudinaliter dehiscentibus. *Ovarium* oblongum vel obovoideum obtusum sessile triloculare, ovulis in loculo pluribus superpositis, stylis tribus brevibus falcatis apice oblique interne stigmatosis. *Capsula* chartacea oblonga vel obovoidea leviter sulcata loculicide trivalvis, seminibus minutis globosis, testa brunnea membranacea, raphe valida, albumine firmo, embryone minuto. *Herbæ glabræ caulescentes, cormo parvo tunicis membranaceis præditæ, foliis paucis segregatis graminoideis, floribus atropurpureis vel albidis parvis solitariis vel corymbosis, bracteis linearibus foliaceis.*

Perianthium atropurpureum, segmentis lineari-subulatis
1. *I. indica.*

Perianthium albidum, segmentis oblanceolatis venis pluribus segregatis percursis.
2. *I. pallida.* 3. *I. novæ-zelandiæ.* 4. *I. guineensis.*

1. I. indica, *Kunth et Benth. locc. citt.*; *F. Muell. Fragm.* vii. 74.—Melanthium indicum, *Linn. Mant.* 226; *Willd. Sp. Plant.* ii. 268.—Anguillaria indica, *R. Br. Prod.* 273; *Wall. Pl. Asiat. Rar.* iii. 37, t. 259.—Hypoxidopsis pumila, *Steud. loc. cit.*—Anguillaria Heyneana, *Wall. Cat.* No. 5086. Cormus globosus 5 6 lin. crassus, tunicis brunneis membranaceis, collo hypogæo 1–2 poll. longo. Caulis flexuosus 3–9-pollicaris, foliis 4–6 linearibus, inferioribus semipedalibus 2–6 lin. latis, superioribus sensim minoribus. Flores sæpissime pauci (interdum ad 27, teste Salisburio) corymbosi, pedicellis strictis ascendentibus 1–2 poll. longis, bracteis parvis linearibus foliaceis. Perianthium atropurpureum 3–4 lin. longum, segmentis lineari-subulatis unguiculatis flore expanso patulis vel reflexis. Stamina perianthio triplo breviora. Capsula obovoidea 6–9 lin. longa, stylis minutis falcatis atropurpureis. *India orientalis tropicalis et subtemperata in montibus Himalaya ad* 6000–7000 *pedes ascendens. Burma,* Wallich! *Zeylania,* Thwaites 3680! *Australia borealis,* Bowman! etc.—Anguillaria Heyneana, *Wall. Cat.* No. 5086, est forma mera robusta.—I. racemosa, *Kunth, Enum.* iv. 213 (Melanthium racemosum, *Roth*), est

forma parviflora, foliis lineari-subulatis.—I. ? CARICINAM, *Kunth, loc. cit.* (Melanthium caricinum, *Roth*), non vidi.

2. I. PALLIDA, *Baker.* Cormus globosus 5–6 lin. crassus, tunicis brunneis membranaceis, collo hypogæo 1–1½ poll. longo. Caulis supra terram 3–4-pollicaris flexuosus, foliis productis sæpissime 4 linearibus graminoideis 1½–3 lin. latis, inferioribus 3–4 poll. longis. Flores 1–4 corymbosi, pedicellis ascendentibus 3–18 lin. longis, bracteis linearibus foliaceis. Perianthium albidum 3–4½ lin. longum, segmentis oblanceolatis acutis 1–1¼ lin. latis venis crebris percursis. Stamina segmentis triplo breviora, antheris pallidis filamento quadruplo brevioribus. Ovarium minutum obovoideum, stylis brevissimis liberis falcatis. *India orientalis tropicalis in ditione Concan,* Ritchie ! Stocks ! Law !

3. I. NOVÆ-ZELANDIÆ, *Baker.* Cormus ovoideus 3 lin. crassus, tunicis brunneis membranaceis, collo hypogæo pollicari. Caulis supra terram pollicaris uniflorus, foliis productis 2–3 linearibus 2–3 poll. longis. Perianthium albidum 2–2½ lin. longum, segmentis lanceolatis acutis venis 6–8 longitudinalibus percursis. Stamina segmentis paulo breviora, antheris albidis subglobosis. Ovarium minutum obovoideum, stylis tribus liberis subulatis. *Insula Nova Zelandia,* Lyall ! Armstrong !

4. I. GUINEENSIS, *Baker.*—Melanthium guineense, *Welw. Herb.* Cormus 4 lin. crassus, tunicis brunneis membranaceis, collo hypogæo 1–1½-pollicari. Caulis semipedalis, foliis 2 linearibus 2–3 poll. longis instructus Flores 3 corymbosi, pedicellis strictis ascendentibus 12–18 lin. longis. Perianthium 4 lin. longum albidum purpureo tinctum, segmentis oblanceolatis obscure unguiculatis. Stamina segmentis triplo breviora, antheris pallidis minutis. Ovarium minutum, stylis tribus falcatis liberis subulatis. *Angola,* Welwitsch 1625–1626 !

18. ANGUILLARIA, *R. Br.*

R. Br. Prodr. 273 ; *Kunth, Enum.* iv. 158 ; *Benth. Fl. Austral.* vii. 29.

Flores polygami vel omnes hermaphroditi. *Perianthium* firmum 6-partitum, segmentis lanceolatis æqualibus sæpe supra basin glandula hippocrepiformi foveolatis flore expanso patulis. *Stamina* 6 hypogyna segmentis breviora, filamentis linearibus, antheris minutis oblongis versatilibus dorsifixis extrorsum longitudinaliter dehiscentibus. *Ovarium* obovoideum obtusum, ovulis in loculo crebris superpositis, stylis filiformibus liberis vel basi coalitis, apice interne stigmatosis. *Capsula* obovoidea triquetra chartacea loculicide trivalvis, seminibus globosis, testa brunnea membranacea, albumine firmo, embryone minuto. *Herbæ glabræ caulescentes, bulbo tunicis membranaceis vestito, foliis paucis angustis*

superpositis, floribus spicatis raro solitariis haud bracteatis pallidis persistentibus.

Flores polygami, stylis liberis .... 1. *A. dioica.*
Flores hermaphroditi, stylis basi coalitis......... 2. *A. densiflora.*

1. A. DIOICA, *R. Br. Prodr.* 273; *Kunth, Enum.* iv. 158; *Hook. fil. Fl. Tasm.* ii. 46; *Endl. Icon.* t. 3; *Benth. Fl. Austral.* vii. 29.—A. biglandulosa *et* uniflora, *R. Br. et Kunth, locc. citt.*—A. australis, *F. Muell. Fragm.* vii. 74.—A. monantha, *Endl. in Preiss.* ii. 45.—Melanthium Brownii, *Schlecht. in Linnæa,* i. 86.—Pleea Sieberi, *Reich. in Sieb. Pl. Exsic.* No. 156. Bulbus ovoideus 3–6 lin. crassus, tunicis brunneis membranaceis, collo hypogæo 1–3 poll. longo. Caulis 3–12-pollicaris gracilis leviter flexuosus, foliis 3–4 productis linearibus vel lineari-subulatis basi dilatatis, interioribus 3–6 poll. longis. Flores polygami vel hermaphroditi pauci spicati vel raro solitarii. Perianthium 3–6 lin. longum, segmentis lanceolatis sæpissime supra basin glandula nigricante hippocrepiformi foveolatis. stamina perfecta segmentis 2–3plo breviora. Ovarium sæpe staminibus imperfectis cinctum, stylis liberis 1–1½ lin. longis. *Tasmania et Australia occidentalis et orientalis.*—A. UNIFLORA, *R. Br.*, est forma mera nana uniflora; A. BIGLANDULOSA, *R. Br.*, forma floribus hermaphroditis, segmentorum foveola medio diffracta.

2. A. DENSIFLORA, *Benth. Fl. Austral.* vii. 29. Bulbus globosus 1 poll. crassus, tunicis copiosis brunneis. Caulis semipedalis, foliis tribus linearibus basi dilatatis, inferioribus 2–3 poll. longis. Flores hermaphroditi 3–6 dense spicati. Perianthium 4–5 lin. longum, segmentis lanceolatis facie haud foveolatis. Stamina segmentis paulo breviora, antheris oblongis ½ lin. longis. Styli 1½ lin. longi deorsum coaliti. *Australia occidentalis,* Murchison! Gray.

19. SANDERSONIA, *Hook.*

Hook. in Bot. Mag. t. 4716; *Harv. Cape Genera,* edit. ii. 403.

Perianthium corollinum gamophyllum globoso-urceolatum, tubo basi 6-saccato, segmentis 6 deltoideis vel lanceolatis æqualibus erectis. *Stamina* 6 hypogyna, filamentis filiformibus, antheris lineari-oblongis demum versatilibus extrorsum dehiscentibus. *Ovarium* triloculare, ovulis in loculo crebris superpositis; stylus filiformis, stigmatibus tribus subulatis falcatis intus stigmatosis. *Fructus* ignotus. *Herbæ erectæ glabræ, rhizomate tuberoso* Gloriosæ, *caulibus inferne nudis superne crebre foliatis, foliis firmis alternis sessilibus apice acuminatis haud cirrosis, floribus singulis ex axillis foliorum superiorum productis luteis vel purpurascentibus, pedicellis apice cernuis.*

Perianthii segmenta magna lanceolata .... 1. *S. littonioides.*
Perianthii segmenta parva deltoidea .... 2. *S. aurantiaca.*

1. S. LITTONIOIDES, *Welw.*; *Baker in Trans. Linn. Soc.* ser. 2, *Bot.* i. 262. Caulis sesquipedalis, foliis oblongo-lanceolatis 2–4 poll. longis deorsum 9–12 lin. latis. Pedicelli 1–2 poll. longi. Perianthium aurantiaco-purpureum 8–9 lin. longum, segmentis lanceolatis quam tubus quadruplo longioribus facie maculis atropurpureis decoratis. Stamina perianthio duplo breviora, antheris $1\frac{1}{2}$ lin. longis. Ovarium oblongum 3–4 lin. longum; stylus ovario æquilongus apice tricuspidatus. *Angola in ditione Pungo Andongo in sylvis alt.* 2400–3800 *pedum,* Welwitsch!

2. S. AURANTIACA, *Hook. loc. cit.* Caulis 1–2-pedalis, foliis linearibus vel lanceolatis 3–4 poll. longis, deorsum 3–9 lin. latis. Pedicelli 6–12 lin. longi. Perianthium aurantiacum 9–12 lin. longum, segmentis brevissimis deltoideis. Genitalia 3 lin. longa. *Natal et Kaffraria,* Sanderson! Sutherland! Gerrard 527! &c.

20. LEUCOCRINUM, *Nuttall.*

Nuttall, MSS.! *A. Gray in Ann. Lyc. New York,* iv. 150; *Kunth, Enum.* iv. 150; *S. Wats. Bot. 40th Parall.* 349, t. 36. f. 1–3.

Perianthium corollinum albidum hypocrateriforme marcescens, tubo cylindrico apice infundibulari, segmentis 6 lanceolatis flore expanso patulis tubo multo brevioribus. *Stamina* 6 ad faucem tubi inserta, filamentis filiformibus, antheris lineari-oblongis basifixis margine dehiscentibus post fœcundationem spiraliter tortis. *Ovarium* globosum triloculare ad basin tubi sessile, ovulis in loculo pluribus biseriatis; stylus filiformis ex tubo protrusus, stigmate capitato trigono. *Capsula* parva globoso-triquetra, seminibus in loculo 5–6 atris turgidis.

1. L. MONTANUM, *Nuttall et auctt. locc. citt.* Herba acaulis perennis glabra, rhizomate obliquo, fibris radicalibus pluribus cylindricis, tunicis interioribus supra collum productis lanceolatis hyalinis. Folia plura linearia erecta persistentia canaliculata 4–6 poll. longa $1\frac{1}{2}$ lin. lata, margine cartilaginea. Flores 4–8 suaveolentes, pedicellis brevissimis, bracteis linearibus hyalinis. Perianthium album, tubo 2–3 poll. longo, segmentis 6–9 lin. longis venis 6–8 segregatis percursis. Stamina segmentis breviora, antheris 2 lin. longis. Capsula 3–4 lin. longa et lata coriacea, valvis dorso haud ventricosis. *California et Montes Scopulosi Americæ borealis,* Nuttall! Fremont 380! Parry 349! &c. Floratio vernalis.

Var. MAJOR. Folia subpedalia. Perianthii tubus 4-pollicaris, limbo expanso 2 poll. lato. *Nevada,* teste S. Watson loc. cit.

21. Weldenia, *Schult. fil.**

Schult. fil. in Bot. Zeit. 1829, i. t. 1 A; *Syst. Veg.* vii. 1136; *Kunth, Enum.* iv. 152.

Perianthium corollinum album hypocrateriforme marcescens, tubo longo cylindrico, segmentis tribus obovatis obtusis flore expanso patulis quam tubus multo brevioribus. *Stamina* 6 ad faucem tubi inserta segmentis breviora, filamentis filiformibus, antheris lanceolatis basi profunde sagittatis affixis, extrorsum longitudinaliter dehiscentibus. *Ovarium* oblongum sessile triloculare, ovulis in loculo 3–4; stylus filiformis ex tubo protrusus; stigmate capitato trigono. *Fructus* ignotus.

1. W. candida, *Schultes, fil. loc. cit.* Herba acaulis tripollicaris, radice ignota, tunicis interioribus supra collum productis hyalinis. Folia plura erecta glabra lanceolata 2 poll. longa, deorsum 4–6 lin. lata, interiora gradatim angustiora. Flores fere 40 in centro foliorum subsessiles, singuli spatha tubulosa membranacea hyalina cincti. Perianthii tubus 2½ poll. longus ex spatha demum 1 poll. protrusus; limbus expansus pollicaris, segmentis circiter 6 lin. longis 4 lin. latis. Filamenta alba 2 lin. longa. *Mexico ad montem Nevado de Toluca,* Karwinski. Non vidi.

22. Milligania, *Hook. fil.*

Hook. fil. in Hook. Kew Journ. v. 296, t. 9; *Fl. Tasm.* ii. 61; *Benth. Fl. Austral.* vii. 25.

Perianthium membranaceum persistens campanulatum basi gamophyllum, segmentis oblongo-lanceolatis multinervatis flore expanso patulis vel reflexis. *Stamina* 6 minuta perigyna, filamentis filiformibus, antheris globosis bilocularibus suberectis secus margines longitudinaliter dehiscentibus. *Ovarium* globosum sessile triloculare, ovulis in loculo pluribus superpositis; styli basi solum vel pæne ad apicem coaliti, apice stigmatosi. *Capsula* parva membranacea globosa loculicido-trivalvis; seminibus linearibus apice appendiculatis, testa nigra crustacea, albumine carnoso, embryone elongato cylindrico. *Herbæ cæspitosæ sæpissime pilosæ, foliis pluribus linearibus vel lanceolatis, radicalibus dense rosulatis, caulinis paucis reductis, floribus sæpissime copiose paniculatis parvis albidis, bracteis lanceolatis, pedicellis inarticulatis. Habitus* Asteliæ; *recedit floribus hermaphroditis, perianthio basi gamophyllo, fructu capsulari etc.*

* Since the above was written, Mr. C. B. Clarke has procured the original type specimen from the Brussels herbarium; and the plant proves not to belong to Liliaceæ at all, but to be identical with Lampra, *Benth.*, in Commelynaceæ.

Styli basi solum coaliti.
 Panicula laxa. Folia linearia .... 1. *M. longifolia.*
 Panicula densa. Folia lanceolata............... 2. *M. densiflora.*
Styli apice solum liberi.
 Flores pauci corymbosi. Perianthii tubus oblongus.
 3. *M. Johnstoni.*
 Flores multi paniculati. Perianthii tubus brevissimus.
 4. *M. stylosa.*

1. M. LONGIFOLIA, *Hook. fil. & Benth. locc. citt.* Herba perennis 1–2-pedalis, rhizomate crasso, collo setis foliorum delapsorum coronato. Folia radicalia rosulata linearia membranacea 1–3-pedalia, basi 3–6 lin. lata, utrinque viridia, pilis mollibus patentibus prædita. Caulis $\frac{1}{2}$–1-pedalis dense lanosa, foliis paucis reductis instructis. Panicula laxa semipedalis vel pedalis, ramis ascendentibus pilosis flexuosis inferioribus valde compositis, pedicellis 1–4 lin. longis, bracteis ultimis lanceolatis 3–4 lin. longis. Perianthium 3 lin. longum, segmentis ascendentibus quam tubus triplo longioribus, flore expanso patulis. Stamina minutissima, antheris subglobosis. Styli falcati, basi solum coaliti. Capsula globosa 2 lin. longa in perianthio persistente inclusa. *Tasmania ad rupes calcareas,* Milligan! Gunn! etc.

2. M. DENSIFLORA, *Hook. fil. Fl. Tasm.* ii. 62; *Benth. Fl. Austral.* vii. 26. Herba perennis pedalis vel sesquipedalis, rhizomate crasso, collo setis haud coronato. Folia radicalia rosulata lanceolata semipedalia vel pedalia subcoriacea utrinque viridia pilis paucis deciduis præsertim ad margines instructa, basi 1 poll. lata. Caulis semipedalis dense albido-pilosus, foliis 1–2 reductis erectis præditus. Panicula densa semipedalis, ramis ascendentibus pilosis, inferioribus valde compositis, pedicellis nullis vel brevissimis, bracteis lanceolatis 3–4 lin. longis. Perianthium 4 lin. longum, segmentis quam tubus pilosus triplo longioribus, flore expanso patulis. Stamina minutissima, antheris subglobosis. Styli falcati basi solum coaliti. Capsula globosa, in perianthii persistentis tubo inclusa. *Tasmania ad Montes Sorrel et Lapeyrouse,* Milligan! Oldfield!

3. M. JOHNSTONI, *F. Muell. in Benth. Fl. Austral.* vii. 26. Herba perennis 2–3-pollicaris, rhizomate crasso. Folia erecta subcoriacea lanceolata acuta utrinque viridia glabra 1 poll. longa. Caulis gracilis pollicaris tenuiter adpresse albido pilosus. Flores 3–6 corymbosi albidi, odore hyacinthini, pedicellis subnullis, bracteis magnis lanceolatis flores suboccultantibus. Perianthium 4 lin. longum, segmentis falcatis tubo oblongo æquilongis. Stamina minutissima, antheris subglobosis. Stylus apice breviter tricuspidatus. Capsula in perianthii tubo inclusa. *Tasmania in alpibus fluminis Huon,* Johnston!

4. M. STYLOSA, *F. Muell. in Benth. Fl. Austral.* vii. 27. Herba per-

ennis erecta sesquipedalis, rhizomate crasso duro. Folia radicalia rosulata lanceolata semipedalia vel pedalia acuminata basi 1 poll. lata, facie glabra viridia, dorso albo-incana, margine dense ciliata. Caulis 6–9-pollicaris breviter lanosus, foliis paucis reductis lanceolatis striatis instructus. Panicula subdensa semipedalis, ramis ascendentibus pilosis, inferioribus valde compositis, pedicellis 2–4 lin. longis, bracteis ultimis scariosis lanceolatis 3 lin. longis. Perianthium 2 lin. longum, post anthesin e basi reflexum, tubo brevissimo, segmentis lanceolatis. Stamina perianthio paulo breviora. Capsula glabra globosa 1½ lin. longa, stylo 1 lin. longo apice breviter tricuspidato. *Tasmania ad cacumen montis Lapeyrouse,* Oldfield! Stuart!

23. Bulbocodium, *Linn.*

Linn. Gen. No. 407; *Kunth, Enum.* iv. 145 (excl. sp.); *Endlich. Gen.* No. 1085.

Perianthium corollinum infundibulare 6-partitum, segmentis conformibus oblanceolatis longe unguiculatis, unguibus filiformibus diu conniventibus. *Stamina* 6 inclusa ad basin laminarum inserta subuniseriata, filamentis filiformibus, antheris bilocularibus lineari-oblongis versatilibus basi sagittatis. *Ovarium* sessile triloculare, ovulis in loculo crebris superpositis; stylus simplex elongatus apice tricuspidatus, ramis stigmatosis subulatis falcatis. *Capsula* oblonga coriacea septicide trivalvis, carpellis apice rostratis, seminibus pluribus turgidis, testa membranacea brunnea ad umbilicum incrassata, albumine corneo, embryone cylindrico. *Herba acaulis, habitu* Colchici, *cormis magnis tunicatis, novellis sessilibus, foliis synanthiis, floribus vernalibus lilacinis.*

1. B. vernum, *Linn. Sp.* 422; *Curt. Bot. Mag.* t. 153; *Red. Lil.* t. 197; *Schult. fil. Syst.* vii. 1134; *Kunth, Enum.* iv. 146 (excl. syn.); *Gren. Fl. France,* iii. 169; *Reich. Ic. Germ.* fig. 953–955. Cormus ovoideus 6–9 lin. crassus, tunicis multis brunneis membranaceis, interioribus 1–2 poll. supra collum productis. Folia producta sæpe 3 synanthia lanceolata, demum lorata 6–9 poll. longa medio 6–9 lin. lata. Flores 1–3 vernales vel æstivales, lilacini; lamina lanceolata 1–2 poll. longa obtusa vel subacuta 3–6 lin. lata venis 15–30 percursa, basi sæpissime auriculata; ungues filiformes 2–3 poll. longi. Antheræ lineari-oblongæ 1½–2 lin. longæ, filamentis filiformibus 3–6 lin. longis basi incrassatis nectariferis. Stigmata 3–6 lin. longa. Capsulæ oblongæ 1 poll. longæ, carpellis apice rostratis. *Alpes Delphinatûs, Sabaudiæ et Helvetiæ.*

Var. B. versicolor, *Spreng. Syst.* ii. 40; *Kunth, Enum.* iv. 147.—Colchicum versicolor, *Ker in Bot. Reg.* t. 571, excl. syn. *Clusii.*—B. ruthenicum, *Bunge, Ind. Sem. Dorp.* 1837, 11; *Kunth, Enum.* iv. 146; *Led.*

Ross. iv. 206 : est varietas gracilis, foliis angustioribus, floribus minoribus. *Rossia meridionalis, Transylvania, Hungaria.*—B. EDENTATUM, *Schur Transyl.* 678 ; *Verh. Sieber Verein,* 1851, 163, t. 6. fig. 1, 2, est forma hujus varietatis auriculis laminarum nullis.

24. GLORIOSA, *Linn.*

Linn. Gen. No. 413 ; *Schultes, fil. Syst. Veg.* vii. 29 et 365.—Methonica (*Herm.*), *Juss. Gen.* 48 ; *Endlich. Gen.* No. 1099 ; *Kunth, Enum.* iv. 275.—Clinostylis, *Hochst. in Flora,* 1844, 26.

Perianthium corollinum 6-partitum persistens, segmentis subæqualibus lanceolatis vel oblongis acutis, unguis lateribus incurvatis, flore expanso reflexis. *Stamina* 6 hypogyna segmentis breviora, filamentis filiformibus, antheris lineari-oblongis versatilibus dorsifixis extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile oblongum obtusum triloculare, ovulis in loculo crebris superpositis; stylus elongatus simplex filiformis a basi deflexus, ramis tribus falcatis subulatis intus stigmatosis. *Capsula* magna coriacea oblonga septicide trivalvis, seminibus globosis magnitudine pisi, testa laxa coccinea intus spongiosa, albumine duro, embryone cylindrico. *Herbæ glabræ elongatæ sursum scandentes, tubere magno furcato tunica membranacea præditæ, foliis sessilibus oppositis vel ternatis costatis ovato-lanceolatis vel lanceolatis raro linearibus apice acuminatis circinato-cirriferis, floribus corymbosis magnis speciosis sæpissime rubro-luteis.*

Perianthii segmenta valde crispata 3–4 lin. lata. 1. *G. superba,*
Perianthii segmenta plana 6–9 lin. lata .... 2. *G. virescens.*
Perianthii segmenta plana 12–18 lin. lata ...... 3. *G. abyssinica.*

1. G. SUPERBA, *Linn. Sp. Plant.* 437 ; *Bot. Reg.* t. 77 ; *Andr. Bot. Rep.* t. 129 ; *Reich. Exot.* t. 51 ; *Wight, Ic.* t. 2047.—G. angulata, *Schum. Besk. Guin.* 171.—Methonica superba, *Lam. Ency.* iv. 133 ; *Red. Lil.* t. 26 ; *Kunth, Enum.* iv. 276. Herba glabra late scandens 10–20-pedalis, caule sursum flexuoso. Folia sessilia oblongo-lanceolata semipedalia 6–24 lin. lata apice circinato-cirrifera opposita vel terna. Flores plures laxe corymbosi, pedicellis cernuis 2–4 poll. raro 6–12 poll. longis basi foliis magnis singulis bracteatis. Perianthium 2–3 poll. longum, segmentis lanceolatis valde crispatis medio 3–4 lin. latis sursum splendide rubris deorsum luteis. Filamenta 18–21 lin. longa, antheris 6–8 lin. longis. Ovarium 6–9 lin. longum, stylo $1\frac{1}{2}$–2 poll. longo, ramis 3–4 lin. longis. Capsula bipollicaris et ultra. *India orientalis ad* 5000 *pedes ascendens, Zeylania, Birma, Malaya, Borneo, Siam, Guinea, Angola, Natal, Zambesi-land.* G. DONIANA, *Schultes fil. Syst.* vii. 366 (Methonica Doniana, *Kunth, Enum. loc. cit.*), est forma humilis uniflora.

Var. ANGUSTIFOLIA. Folia linearia 3–4 lin. lata. Perianthii segmenta medio 2-3 lin. lata. *Africa tropicalis occidentalis ad ripas fluminis Rovuma,* Dr. Meller!

2. G. VIRESCENS, *Lindl. in Bot. Mag.* t. 2539; *Hook. in Bot. Mag.* t. 4938.—G. superba, var. β, *Lam. Encyc.* iv. 133.—Methonica virescens, *Kunth, Enum.* iv. 277.—M. Plantii *hort., Fl. des Serres,* t. 865.—M. Petersiana, *Klotzsch in Peters's Reisen. Mossamb.* t. 54.—M. platyphylla, *Klotzsch in Peters's Reisen. Mossamb.* t. 55. Habitus et folia omnino G. *superbæ.* Perianthium 1½–2½ poll. longum, segmentis oblanceolatis subplanis medio 5–6 lin. latis rubro-luteis (*M. Plantii* hort.) vel luteo-virescentibus (*M. virescens,* Lindleyi originale). Filamenta segmentis subduplo breviora, antheris 4–4½ lin. longis. Stylus 12–18 lin. longus, ramis 3–4 lin. longis. *Africa tropicalis occidentalis et orientalis, Natal, Transvaal, C. B. Spei.* G. CÆRULEA, *Mill. Dict.* edit. vi. No. 2 (G. simplex, *Linn. Mant.* 62), est species eadem floribus ex exemplis cultis incompletis ab Adansonio in Senegambia lectis male dictis cæruleis.

Var. GRANDIFLORA, *Baker.* (Methonica grandiflora, *Hook. Bot. Mag.* t. 5216; *Ill. Hort.* viii. 273), est forma tropicalis floribus majoribus, perianthii segmentis 3–3½ poll. longis medio 8–9 lin. latis, antheris 8–9 lin. longis. *Guinea ad Grand Bassa,* Vogel! *Fernando Po,* Mann! *Ad ripas Nili albi,* Petherick! M. LEOPOLDII, *Lemaire in Fl. des Serres,* t. 163–164, est forma similis floribus luteis.

3. G. ABYSSINICA, *A. Rich. Fl. Abyss.* ii. 322.—Clinostylis speciosa, *Hochst. in Flora,* 1844, 26. Humilior et minus scandens quam species altera. Folia oblongo-acuminata 12–18 lin. lata. Perianthii segmenta plana oblonga medio 12–18 lin. lata acuta basi cuneata. Filamenta pollicaria, antheris 5–6 lin. longis. *Abyssinia in montibus,* Schimper 346! 1437! Quartin-Dillon & Petit! etc.

25. LITTONIA, *Hook.*

Hook. in Bot. Mag. t. 4723; *Harvey, Cape Gen.* edit. ii. 403.

Perianthium corollinum 6-partitum, segmentis æqualibus lanceolatis acutis planis diu ascendentibus. *Stamina* 6 hypogyna inclusa, filamentis filiformibus, antheris lineari-oblongis dorsifixis versatilibus extrorsum longitudinaliter dehiscentibus. *Ovarium* oblongum triloculare, ovulis in loculo crebris superpositis; stylus erectus filiformis, ramis tribus falcatis subulatis intus stigmatosis. *Capsula* oblonga coriacea septicido-trivalvis, seminibus rubris nitidis globosis. *Habitus et folia omnino* Gloriosæ; *solum recedit stylo erecto, perianthii segmentis flore expanso haud reflexis.*

1. L. MODESTA, *Hook. loc. cit.* Herba glabra superne scandens, caule

sulcato. Folia oblongo-lanceolata vel lanceolata apice circinato-cirrifera, centralia 3–4na 4–5 poll. longa 9–15 lin. lata. Flores ex axillis foliorum superiorum solitarii, pedicellis 1–2 poll. longis apice cernuis. Perianthium flavum 9–15 lin. longum, segmentis acutis medio 3–4 lin. latis. Filamenta 3–4 lin. longa, antheris filamento subduplo brevioribus. Ovarium 3 lin. longum; stylus ovario æquilongus, stigmatibus falcatis 1 lin. longis. *Natal, Kaffraria, Transvaal.*

26. Heloniopsis, *A. Gray.*

A. Gray, Bot. Jap. 416; *Miquel in Ann. Mus. Lugd. Bat.* iii. 146.—Sugerokia, *Miquel, "Versl. en Med. K. Akad. Wet.* ser. 2, ii. 88;" *Ann. Mus. Lugd. Bat.* iii. 144.—Scillæ sp., *Thunb.*

Perianthium firmum viridulum 6-partitum persistens diu campanulatum, segmentis oblanceolatis subæqualibus laxe multinervatis. *Stamina* 6 hypogyna vel obscure perigyna, filamentis filiformibus perianthio æquilongis, antheris bilocularibus oblongis leviter versatilibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile depresso-globosum triloculare, ovulis in loculo crebris; stylus elongatus subulatus, stigmate capitato peltato. *Capsula* chartacea septicido-trivalvis, seminibus in loculo permultis minutis utrinque vel basi caudatis. *Herbæ glabræ rhizomatosæ, foliis radicalibus subpetiolatis oblanceolatis dense rosulatis membranaceis multinervatis, pedunculis foliis paucis reductis amplectentibus præditis, floribus parvis persistentibus racemosis vel corymbosis, pedicellis inarticulatis ebracteatis.*

Pedicelli perianthio breviores .... 1. *H. breviscapa.*
Pedicelli perianthio æquilongi .... 2. *H. umbellata.*
Pedicelli perianthio longiores.
  Semina utrinque caudata .... 3. *H. japonica.*
  Semina apice exappendiculata .... 4. *H. pauciflora.*

1. H. breviscapa, *Maxim. in Bull. Acad. Imp. Petr.* vi. 211; *Franch. et Savat. Enum. Jap.* ii. 87.—H. japonica, *Miquel, Ann. Mus. Lug. Bat.* iii. 146, ex parte. Rhizoma breve crassum præmorsum. Folia plura oblanceolata tempore florendi 3–6 poll. longa 8–9 lin. lata basi longe angustata. Caulis 4–8-pollicaris, foliis 3–4 reductis præditus. Racemus densus brevis 4–6-florus, pedicellis 1½–2 lin. longis. Perianthium 4–4½ lin. longum, segmentis obtusis 1½ lin. latis. Stamina brevissime exserta, antheris oblongis 1 lin. longis. Stylus purpureus exsertus 3–3½ lin. longus. Capsulam non vidi. *Japonia in monte ignivomo Wurzen* Maximowicz!

H. GRANDIFLORA, *Franch. & Sav. Enum. Jap.* ii. 88 & 529, ex icone Japonica citata, vix differt nisi floribus paulo majoribus.

2. H. UMBELLATA, *Baker in Trimen Journ.* 1874, 278. Rhizoma breve gracile. Folia plura oblanceolata mucronata tempore florendi 1½ poll. longa 5–6 lin. lata, ad basin angustata. Caulis 2½–5-pollicaris, foliis 4–5 reductis præditus. Flores 3–10 umbellati, pedicellis 4–4½ lin. longis. Perianthium 3–3½ lin. longum, segmentis obtusis vix 1 lin. latis. Stamina brevissime exserta, antheris oblongis ½ lin. longis. Stylus exsertus 3 lin. longus. Capsulam non vidi. *Formosa*, Swinhoe!

3. H. JAPONICA, *Maxim. in Bull. Acad. Petrop.* vi. 211; *Franch. & Savat. Enum. Jap.* ii. 87.—Scilla japonica, *Thunb. Fl. Jap.* 137; *Icon. Dec.* iv. t. 4; *Kunth, Enum.* iv. 330.—Sugerokia japonica, *Miquel in Ann. Mus. Lug. Bat.* iii. 145. Rhizoma gracile elongatum præmorsum. Folia oblanceolata tempore florendi 3–4 poll. longa 1 poll. lata. Caulis 1–2-pedalis, foliis reductis 3–4 præditus. Racemus brevis 4–6-florus, pedicellis flore sæpissime longioribus. Perianthium 5–6 lin. longum. Stamina exserta, antheris oblongis. Stylus 5–6 lin. longus. Semina utrinque longe appendiculata. *Japonia in sylvis humidis regionis montanæ*, Maximowicz! Buerger! Savatier 1239, etc.

4. H. PAUCIFLORA, *A. Gray, Bot. Jap.* 146; *Maxim. in Bull. Acad. Petrop.* vi. 211; *Miquel in Ann. Mus. Lug. Bat.* iii. 146, ex parte. Rhizoma gracile elongatum. Folia oblanceolata 3–4 poll. longa, 1 poll. lata, basi longe angustata. Caulis 1–2-pedalis, foliis paucis reductis instructus. Racemus laxus pauciflorus, pedicellis 6–9 lin. longis. Perianthium 6 lin. longum. Stamina perianthio æquilonga. Stylus semipollicaris. Semina apice haud appendiculata. *Japonia ad Cape Romanzoff*, Small!

27. HEWARDIA, *Hook.*

Hook. Ic. t. 858; *Hook. fil. Fl. Tasm.* ii. 47; *Benth. Fl. Austral.* vii. 25, *non J. Smith.*

Perianthium sub-6-partitum persistens purpureum, segmentis lanceolatis acutis flore expanso stellato-patentibus. *Stamina* 3 perigyna ad basin segmentorum interiorum inserta, filamentis brevibus leviter applanatis, antheris bilocularibus erectis basifixis ligulatis extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile ampullæforme, ovulis in loculo pluribus; stylus brevis cylindricus, stigmatibus tribus crassis falcatis. *Capsula* oblonga coriacea loculicide trivalvis. *Semina* ignota. *Ad Irideas accedit staminibus exterioribus obsoletis et foliis distichis duris æquitantibus.*

1. H. TASMANICA, *Hook. loc. cit.* Rhizoma crassum durum, fibris radicalibus gracilibus. Folia radicalia plura disticha equitantia erecta rigide coriacea linearia 3–6 raro 12 poll. longa 2–3 lin. lata. Caulis 3–12-pollicaris uniflorus, foliis 3–4 lanceolato-navicularibus scariosis 1–3 poll. longis præditus, supremis suboppositis *Iridis* spatham simulantibus. Perianthii segmenta saturate purpurea linearia acuta 12–18 lin. longa, 3–4 lin. lata. Genitalia perianthio triplo breviora. Antheræ 3 lin. longæ. *Tasmania in ericetis et montanis.*

28. UVULARIA, *Linn.*

Linn. Gen. No. 412 (excl. sp.); *Schultes fil. Syst. Veg.* vii. 30 & 367; *Endl. Gen.* No. 1080; *Kunth, Enum.* iv. 200.

Perianthium corollinum 6-partitum diu campanulatum caducum, segmentis subæqualibus lanceolatis acutis laxe multinervatis. *Stamina* 6 hypogyna inclusa, filamentis brevibus applanatis, antheris elongatis linearibus basifixis extrorsum longitudinaliter dehiscentibus, connectivo supra loculos plus minusve producto obtuso vel acuto. *Ovarium* sessile vel breviter stipitatum ovoideum triloculare, ovulis in loculo paucis vel pluribus; stylus filiformis profunde trifurcatus, ramis subulatis falcatis introrsum longitudinaliter stigmatosis. *Capsula* coriacea triquetra loculicide trivalvis, seminibus globosis, testa brunnea membranacea, albumine corneo, embryone minuto. *Herbæ erectæ sæpissime glabræ, rhizomate reptante gracili, fibris radicalibus cylindricis cæspitosis, caulibus gracilibus superne ramosis, foliis latis membranaceis multinervatis alternis perfoliatis vel amplexicaulibus, floribus paucis segregatis breviter pedicellatis terminalibus vel axillaribus teneris luteis.*

Folia distincte perfoliata.
  Perianthium intus papillosum. Connectivum longe productum. 1. *U. perfoliata.*
  Perianthium intus haud papillosum. Connectivum breviter productum .... 2. *U. grandiflora.*
Folia sessilia haud perfoliata.
  Folia utrinque viridia margine ciliata .... 3. *U. puberula.*
  Folia subtus glauca margine nuda.
    4. *U. sessilifolia.* 5. *U. floridana.*

1. U. PERFOLIATA, *Linn. Sp.* 437; *Smith, Exot. Bot.* i. 95, t. 49; *Bot. Mag.* t. 255; *Kunth, Enum.* iv. 200; *A. Gray, Fl. N. States,* edit. v. 528.

—U. perfoliata var. minor, *Michx. Fl.* i. 199; *Red. Lil.* t. 184. Herba erecta glabra subpedalis, caule superne furcato. Folia 6–12 perfoliata oblonga subacuta membranacea viridia 1½–3 poll. longa subtus pallidiora. Flores 1 vel pauci cernui terminales, pedicellis 3–6 lin. longis. Perianthium 9–15 lin. longum pallide flavum, segmentis lanceolatis acutis 2–3 lin. latis intus valde papillosis. Antheræ 5–6 lin. longæ, connectivo angusto supra loculos distincte producto. Stylus 5–6 lin. longus profunde trifidus antheras haud superans. Capsula sessilis obverse deltoidea truncata 3–4 lin. longa. *America borealis orientalis a Canada ad Carolinam, in sylvis frequens.* U. FLAVA, *Smith, Exot. Bot.* i. 97, t. 50, est forma floribus majoribus saturatioribus. U. LANCEOLATA, *Soland. in Ait. Hort. Kew.* i. 434, est forma mera angustifolia.

2. U. GRANDIFLORA, *Smith, Exot. Bot.* i. 95. t. 51; *Bot. Mag.* t. 1112; *Kunth, Enum.* iv. 201; *A. Gray, Fl. N. States,* edit. v. 528.—U. perfoliata, var. major, *Michx. Fl.* i. 199; *Red. Lil.* t. 184. Habitus omnino *U. perfoliatæ,* sed paulo robustior. Folia oblonga membranacea perfoliata glabra 2–4 poll. longa. Flores 1–3 terminales, pedicellis 6–9 lin. longis. Perianthium pallide flavum 15–18 lin. longum, segmentis lanceolatis acutis 3–4 lin. latis intus haud papillosis. Antheræ 6–8 lin. longæ, connectivo lato breviter producto. Stylus antheras haud superans. Capsula sessilis globoso-triquetra semipollicaris. *America borealis orientalis a Canada ad Carolinam et Georgiam.*

3. U. PUBERULA, *Michx. Fl.* i. 199; *Sweet, Brit. Flow. Gard.* ser. ii. t. 21; *Kunth, Enum.* iv. 202, ex parte; *A. Gray, Fl. N. States,* edit. v. 528, *non Smith nec Richards.* Caulis subpedalis, ramis 2–4. Folia 6–15 oblonga sessilia 1½–2 poll. longa acuta vel cuspidata firmiora quam in speciebus alteris, utrinque viridia, margine ciliata. Flores pauci terminales vel axillares, pedicellis 3–9 lin. longis. Perianthium subpollicare, segmentis 1½–2 lin. latis intus haud papillosis. Antheræ 4½–5 lin. longæ, connectivo angusto longe producto. Stylus antheras parum superans. Capsula sessilis late oblongo-triquetra acuta 1 poll. longa. *In sylvis Virginiæ et Carolinæ,* Curtis! etc.

4. U. SESSILIFOLIA, *Linn. Sp.* 437; *Smith, Exot. Bot.* i. 101, t. 52; *Bot. Mag.* t. 1402; *Lodd. Bot. Cab.* t. 1262; *Kunth, Enum.* iv. 201; *A. Gray, Fl. N. States,* edit. v. 528. Caulis glaber semipedalis vel pedalis, ramis 2–4. Folia 6–15 oblonga sessilia membranacea acuta 1½–3 poll. longa, basi angustata, infra subglauca. Flores 1–3 axillares vel terminales, pedicellis cernuis 6–9 lin. longis. Perianthium 8–12 lin. longum pallide flavum, segmentis lanceolatis medio 1½–2 lin. latis, intus haud papillosis. Antheræ 4–5 lin. longæ, connectivo lato breviter producto. Stylus antheras superans ad apicem segmentorum pæne attingens, ramis parte integra subduplo brevioribus. Capsula oblongo-triquetra distincte stipitata.

Nova Scotia, New Brunswick, Canada, et Saskatchewan ad Carolinam.

5. U. FLORIDANA, *Chapm. Fl. S. States*, 487. Caulis glaber 4–6-pollicaris. Folia oblonga sessilia membranacea 1 poll. longa subtus glauca. Flores terminales. Perianthium 8 lin. longum pallide luteum, segmentis lineari-lanceolatis intus haud papillosis. Antheræ lineares, connectivo distincte producto. Pistillum perianthio subduplo brevius. *Florida centralis in sylvis umbrosis*, Chapman.

Species exclusa.

U. CIRRHOSA, *Thunb.*=Fritillaria japonica, *Miquel.*

29. TRICYRTIS, *Wallich.*

Wallich, Tent. Fl. Nep. ii. 61, t. 46; *Kunth, Enum.* iv. 278; *Endl. Gen.* No. 1081; *Maxim. in Bull. Acad. Imp. Pé.* vi. 208.—Compsoa, *D. Don, Prodr. Nep.* 51.—Compsanthus, *Spreng. Cur. Post.* 137.—Uvulariæ sp., *Thunb.*

Perianthium corollinum 6-partitum diu campanulatum, segmentis lanceolatis acutis caducis, exterioribus basi saccatis nectariferis, omnibus flore expanso falcatis. *Stamina* 6 hypogyna vel obscure perigyna, filamentis filiformibus perianthio subæquilongis apice undique divergentibus, antheris lineari-oblongis dorsifixis versatilibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile triloculare, ovulis in loculo crebris superpositis; *stylus* rectus filiformis sursum trifurcatus, ramis bifidis subulatis longitudinaliter stigmatosis. *Capsula* coriacea lineari-triquetra septicide trivalvis, seminibus minutis planis uniseriatis, testa laxa atrobrunnea, embryone minuto. *Herbæ caulescentes haud bulbiferæ, fibris radicalibus cæspitosis, foliis multis latis multinervatis amplexicaulibus vel subsessilibus, floribus corymbosis vel racemosis inodoris sæpissime albido-purpureis conspicue purpureo maculatis.*

Folia basi profunde cordato amplexicaulia.
  Caulis pilis patentibus vestitus .... 1. *T. hirta.*
  Caulis puberulus.
    Perianthium albido-purpureum punctatum. 2. *T. pilosa.*
      3. *T. latifolia.*
    Perianthium flavum impunctatum .... 4. *T. flava.*
Folia basi sessilia haud amplexicaulia.
  Folia oblonga .... 5. *T. macropoda.*
  Folia lanceolata .... 6. *T. formosana.*

1. T. HIRTA, *Hook. in Bot. Mag.* t. 5355.—Uvularia hirta, *Thunb. Jap.* 136.—T. japonica, *Miquel in Ann. Mus. Lug. Bat.* iii. 155; *Maxim. in Bull. Acad. Péters.* vi. 208; *Franch. & Sav. Enum. Jap.* ii. 74. Caulis 1–3-pedalis, pilis mollibus albidis patulis ubique vestitus. Folia oblonga cuspidata cordato-amplexicaulia 4–6 poll. longa utrinque viridia tenuiter pilosa. Flores 6–15 racemosi vel subcorymbosi, plerique ex axillis foliorum magnorum orti, pedicellis pilosis 6–12 lin. longis. Perianthium subpollicare, segmentis albidis exterioribus 3–4 lin. latis maculis magnis purpureis ubique decoratis. Filamenta perianthio æquilonga. Ovarium glabrum vel hirtum 5–6 lin. longum; stylus stigmatibus brevior. *Japonia in sylvis umbrosis late disseminata.*

2. T. PILOSA, *Wall. Tent. Nep.* ii. 52; *Kunth, Enum.* iv. 279; *Hook. in Bot. Mag.* t. 4955; *Flore des Serres,* t. 1219.—T. elegans, *Wall. loc. cit. sub* t. 46; *Wall. Cat.* 600.—Campsoa maculata, *D. Don, Prodr. Nep.* 51. Caulis 2–4-pedalis subtiliter pilosus. Folia oblonga cuspidata cordato-amplexicaulia 4–6 poll. longa utrinque viridia tenuiter pilosa. Flores multi laxe corymbosi, bracteis omnibus minutis vel abortivis, vel corymbi rami infimi ex axillis foliorum magnorum interdum orti. Perianthium 8–9 lin. longum, segmentis albidis maculis magnis purpureis ubique decoratis. Filamenta perianthio æquilonga. Ovarium glabrum 4–5 lin. longum. Stylus stigmatibus duplo brevior. Capsula 12–15 lin. longa, 3–4 lin. diam. *Himalayæ orientalis regio subtemperata,* Wallich 600! Griffith 5867! Hook. fil. & Thomson! etc.

3. T. LATIFOLIA, *Maxim. in Bull. Acad. Imp. Péters.* vi. 209; *Franch. et Sav. Enum. Jap.* ii. 74. Caulis glaber flexuosus 2–3-pedalis. Folia glabra profunde cordato-amplexicaulia late oblonga cuspidata vel suprema ovata 4–6 poll. longa medio 2–3 poll. lata. Flores pauci in corymbum terminalem bracteis parvis dispositi, pedicellis erectis puberulis. Perianthium subpollicare, segmentis albidis punctis minutis purpureis ubique decoratis, exterioribus 3 lin. latis. Ovarium glabrum 4½–5 lin. longum; stylus stigmatibus æquilongus. Capsula 12–15 lin. longa. *Japonia,* Tschonoski! Savatier 2127.

4. T. FLAVA, *Maxim. in Bull. Acad. Imp. Péters.* vi. 208; *Franch. et Savat. Enum. Jap.* ii. 75. Caulis humilis sursum obscure puberulus. Folia oblongo-lanceolata acuminata cordato-amplexicaulia. Inflorescentia racemosa, pedicellis axillaribus flore subbrevioribus. Perianthium flavum haud punctatum. Stylus stigmatibus æquilongus. *Japonia in hortis ad Yedo solum visus,* Maximowicz (non vidi).

5. T. MACROPODA, *Miquel in Ann. Mus. Lug. Bat.* iii. 155; *Maxim. Bull. Acad. Péters.* vi. 208; *Regel, Gartenfl.* t. 613; *Franch. et Sav. Enum. Jap.* ii. 74; *Fl. des Serres,* t. 1820. Caulis 2–3-pedalis deorsum glaber sursum puberulus. Folia oblonga acuta 4–5 poll. longa 1½–2 poll.

lata sessilia vel brevissime petiolata basi rotundata utrinque viridia facie glabra dorso pubescentia. Flores in corymbum laxum dispositi, bracteis plerisque minutis, pedicellis puberulis 9–12 lin. longis. Perianthium 9–10 lin. longum albido-purpureum punctis minutis purpureis decoratum. Stylus 3 lin. longus, stigmatibus dense glandulosis duplo brevior. Capsula glabra 12–16 lin. longa. *Japonia in sylvis ad Nagasaki,* Maximowicz! Buerger! Savatier 1304. *China in ditione Kewkiang,* Shearer!

6. T. FORMOSANA, *Baker.* Caulis pedalis flexuosus, deorsum glaber, superne obscure puberulus. Folia pauca sessilia oblanceolata acuta, basi cuneata, inferiora 4-5 poll. longa, medio 9–12 lin. lata, utrinque viridia, facie glabra, dorso ad venas exsculptas hispidula, suprema oblonga breviora. Flores pauci in corymbum laxum bracteis parvis lanceolatis dispositi vel ramum infimum ex folii magni oblongi axilla ortum, pedicellis ultimis brevibus apice cernuis. Perianthium albido-purpureum vix punctatum 9–10 lin. longum. Filamenta perianthio paulo breviora. Ovarium glaber 4–4½ lin. longum; stylus 2 lin. longus, stigmatibus æquilongus. Capsula 9–12 lin. longa. *Formosa,* Oldham 570!

30. KREYSIGIA, *Reich.*

Reich. Icon. Exot. iii. 13, t. 229; *Kunth, Enum.* iv. 209; *Benth. Fl. Austral.* vii. 32.—Tripladenia, *D. Don in Proc. Linn. Soc.* 1839, 46.—Schelhammeræ sp., *Lodd.*

Perianthium campanulatum corollinum 6-partitum, segmentis æqualibus oblanceolatis obtusis laxe multinervatis haud foveolatis nec unguiculatis præfloratione induplicativis supra basin margine glanduliferis. *Stamina* 6 hypogyna perianthio breviora, filamentis brevibus linearibus, antheris oblongis basifixis bilocularibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile globosum triloculare, ovulis in loculo 2–4 superpositis; stylus profunde tricuspidatus, ramis subulatis falcatis intus stigmatosis. *Fructus* subbaccatus demum loculicide trivalvis, seminibus supra convexis, subtus angulatis, ad hilum strophiolatis, testa membranacea, albumine corneo, embryone minuto.

1. K. MULTIFLORA, *Reich. loc. cit.*; *Bot. Mag.* t. 3905; *F. Muell. Fragm.* vii. 71.—Tripladenia Cunninghami, *D. Don, loc. cit.*—Schelhammera multiflora, *Lodd. Bot. Cab.* t. 1511, *non R. Br.* Herba perennis glabra, rhizomate firmo nodoso, caulibus flexuosis gracilibus 1–2-pedalibus multifoliatis. Folia laxa alterna sessilia membranacea oblonga acuta 2–4 poll. longa costata, venis multis parallelis, basi rotundata, utrinque viridia. Pedunculi ex axillis foliorum multorum producti 1–2- raro 3-flori 4–8 lin.

longi, pedicellis strictis 9–12 lin. longis basi bracteis linearibus 3–4 præditis. Perianthium 3–4 lin. longum lilacinum raro album segmentis basi utrinque glandulis stipitatis 2–4 luteis instructis. Genitalia perianthio subduplo breviora. Fructus 3–4 lin. diam. *Australia orientalis temperata.*

31. Schelhammera, *R. Br.*

R. Br. Prodr. 274; *Kunth, Enum.* iv. 210; *Benth. Fl. Austral.* vii. 31.

Perianthium campanulatum corollinum 6-partitum, segmentis subæqualibus lanceolatis acutis basi foveolatis margine haud glanduliferis præfloratione induplicativis. *Stamina* 6 subhypogyna perianthio breviora, filamentis brevibus leviter applanatis, antheris oblongis basifixis bilocularibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile globosum triloculare, ovulis in loculo paucis superpositis; stylus profunde tricuspidatus, ramis subulatis intus stigmatosis. *Fructus* subbaccatus tarde loculicide trivalvis, seminibus turgidis ad hilum strophiolatis, testa brunnea membranacea, albumine corneo, embryone minuto. *Herbæ perennes glabræ, rhizomate gracili, caulibus gracilibus cæspitosis, foliis latis sessilibus membranaceis alternis supremis solum 2–4-natis, floribus parvis lilacinis pedicellatis ad apices ramorum solitariis vel umbellatis.*

Flores solitarii vel gemini........................ 1. *S. undulata.*
Flores multi umbellati .... 2. *S. multiflora.*

1. S. undulata, *R. Br. Prodr.* 274; *Bot. Mag.* t. 2712; *Kunth, Enum.* iv. 211; *F. Muell. Fragm.* vii. 71; *Benth. Fl. Austral.* vii. 31. Caules gracillimi dense cæspitosi 2–8 poll. longi, basi sæpe decumbentes. Folia 4–5 oblonga acuta 1–2 poll. longa membranacea utrinque viridia, suprema sæpissime opposita. Flores ex axilla foliorum superiorum solitarii vel gemini, pedicellis 6–12 lin. longis, fructiferis erectis. Perianthium 3–4 lin. longum, segmentis oblanceolatis. Stamina perianthio duplo breviora. Ovula in loculo 4–6. Fructus 4–5 lin. diam. *Australia orientalis temperata.*

2. S. multiflora, *R. Br. Prodr.* 274; *Kunth, Enum.* iv. 211; *F. Muell. Fragm.* vii. 72; *Benth. Fl. Austral.* vii. 32. Caules 3–9 poll. longi simplices vel ramosi. Folia 6–8 oblonga acuta 1–3 poll. longa chartacea utrinque viridia, suprema 3–4 na. Flores ex axillis foliorum superiorum multi umbellati, pedicellis 3–12 lin. longis, fructiferis sæpissime cernuis. Perianthium 3–4 lin. longum, segmentis lanceolatis. Stamina perianthio

paulo breviora. Ovula in loculo 3–4. Fructus 4 lin. diam., seminibus in loculo 1–2. *Australia orientalis subtropicalis in ditione Queensland.*

32. Xerophyllum, *Rich.*

Rich. in Michx. Fl. Bor. Am. i. 334; *Endl. Gen.* No. 1065 & 1356; *A. Gray in Ann. Lyc. N. York*, iv. 128; *Kunth, Enum.* iv. 177.—Heloniadis sp., *Linn.*

Flores hermaphroditi. *Perianthium* corollinum albidum 6-partitum, segmentis lanceolatis æqualibus flore expanso patulis dorso crebre multinervatis. *Stamina* 6 hypogyna, filamentis elongatis subulatis, antheris minutis subglobosis versatilibus bilocularibus extrorsum longitudinaliter dehiscentibus. *Ovarium* globosum sessile triloculare, ovulis in loculo 2 erectis collateralibus; styli 3 subulati falcati longitudinaliter stigmatosi. *Capsula* globosa membranacea loculicido trivalvis; seminibus triquetris erectis exappendiculatis, testa membranacea nitida castanea, albumine firmo, embryone minuto.

1. X. asphodeloides, *Nutt. Gen.* i. 235; *A. Gray & Kunth, loc. cit.* —X. setifolium, *Michx. loc. cit.*; *Lindl. in Bot. Reg.* t. 1613.—Helonias asphodeloides, *Linn. Sp. Plant.* 485; *Bot. Mag.* t. 748. Herba glabra 1½–3-pedalis, rhizomate crasso. Folia radicalia densissime rosulata subulata persistentia pedalia vel sesquipedalia, deorsum 1 lin. lata, facie plana venis utrinque costæ circiter 3, dorso triquetra, margine denticulata. Caulis 1–2-pedalis, foliis reductis setaceis dense vestitus. Racemus densus, floriferus 4–6-pollicaris, 2–3 poll. diam., pedicellis ascendentibus solitariis inarticulatis 12–18 lin. longis, bracteis setaceis firmis. Perianthium 3 lin. longum, segmentis 1–1½ lin. latis. Stamina perianthio paulo breviora. Capsula 2 lin. longa. *America borealis orientalis a Nova Cæsarea ad Carolinam.*

Var. X. tenax, *Nutt. loc. cit.*—Helonias tenax, *Pursh, Flor.* i. 243, t. 9. Robustior, foliis deorsum 1½–2 lin. latis, venis utrinque costæ 5–6, floribus paulo majoribus, bracteis linearibus, staminibus perianthio æquilongis vel demum exsertis. *California et Montes Scopulosi.*

33. Helonias, *Linn.*

Linn. Gen. No. 458, ex parte; *A. Gray in Ann. Lyc. N. York*, iv. 130, ex parte; *Kunth, Enum.* iv. 174.

Flores hermaphroditi. *Perianthium* corollinum 6-partitum persistens, segmentis oblanceolatis subæqualibus dorso laxe ob-

scure nervatis flore expanso patulis. *Stamina* 6 hypogyna perianthio æquilonga, filamentis subulatis, antheris subglobosis cæruleis versatilibus dorsifixis bilocularibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile globosum triloculare, ovulis in loculo crebris superpositis; styli 3 subulati falcati intus longitudinaliter stigmatosi. *Capsula* globosa loculicide trivalvis, seminibus linearibus, utrinque testa producta appendiculatis.

1. H. BULLATA, *Linn. Sp.* 485; *Amœn. Acad.* iii. 12, t. 1. fig. 1; *Andr. Bot. Rep.* t. 352; *Bot. Mag.* t. 747; *Red. Lil.* t. 13.—H. latifolia, *Michx. Flor.* i. 212.—Veratrum racemo simplicissimo, *Miller, Ic.* 181, t. 272.—V. americanum, *Miller, Dict.* edit. 6, No. 4.—Herba glabra perennis ½–2-pedalis, rhizomate crasso repente. Folia radicalia oblanceolata acuta tempore florendi 3–6 poll. longa 9–15 lin. lata costata crebre multinervata ad basin longe angustata. Caulis subscapiformis fistulosus, foliis paucis parvis bracteiformibus solum præditus. Racemus densissimus 1–3-pollicaris, 9–12 lin. diam., pedicellis patulis ebracteatis, infimis perianthio æquilongis. Perianthium viridi-purpureum 3 lin. longum, segmentis 1 lin. latis. *America borealis orientalis in paludosis ab Nova Cæsarea ad Virginiam.*

34. CHAMÆLIRIUM, *Willd.*

Willd. in Berl. Mag. ii. 19; *Kunth, Enum.* iv. 176.—Ophiostachys, *Delile in Red. Lil.* t. 464.—Dasurus, *Salisb. Gen.* 51.—Diclinotrys, *Rafines. Neog.* 3.—Veratri, Melanthii vel Heloniadis sp., *auctt. vett.*

Flores dioici. *Perianthium* corollinum 6-partitum luteum marcescens, segmentis oblanceolatis æqualibus obtusis dorso uninervatis flore expanso patulis. *Masc. Stamina* 6 hypogyna, filamentis subulatis elongatis, antheris minutis luteis subglobosis versatilibus bilocularibus extrorsum longitudinaliter dehiscentibus. *Ovarium* rudimentarium. *Fœm. Filamenta* 6 rudimentaria, antheris nullis. *Ovarium* sessile obovoideum obtusum triloculare, ovulis in loculo paucis superpositis; styli 3 subulati falcati intus longitudinaliter stigmatosi. *Capsula* oblonga chartacea apice loculicide trivalvis, seminibus angustis utrinque alato-appendiculatis, testa membranacea brunnea, embryone minuto.

1. C. LUTEUM, *A. Gray, Fl. N. States,* edit. v. 527; *Chapm. Fl. S. States,* 491.—C. carolinianum, *Willd. loc. cit.*—Veratrum luteum, *Linn. Sp. Plant.* 1479; *Amœn. Acad.* iii. t. 1. fig. 2.—Helonias dioica, *Pursh, Fl.* i. 243.—H. pumila, *Jacq. Coll.* ii. 260, *Ic.* t. 253.—H. lutea, *Ker in*

Bot. Mag. t. 1062.—Ophiostachys virginica, *Desv. loc. cit.* Herba perennis glabra erecta 1–3-pedalis, rhizomate firmo obliquo cylindrico præmorso. Folia radicalia rosulata oblanceolata 3–6 poll. longa 12–15 lin. lata membranacea costata multinervata, utrinque viridia, basi longe angustata subpetiolata. Caulis strictus, foliis multis consimilibus plus minusve reductis præditus. Racemus densus cylindricus 6–12-pollicaris interdum subspicatus 4–8 lin. diam., pedicellis solitariis inarticulatis ebracteatis. Perianthium 1–1¼ lin. longum. Capsula 4–6 lin. longa. *America borealis orientalis a Canada ad Floridam.*

35. Chionographis, *Maxim.*

Maxim. in Bull. Acad. Sc. Péters. vi. 209 (Decad. iii.).—Chamælirii sp., *Miquel.*—Melanthii sp., *Thunb.*

Flores hermaphroditi. *Perianthium* corollinum 6-partitum, segmentis linearibus uninervatis, sæpissime 3 (interdum 2–4) productis, reliquis obsoletis. *Stamina* 6 hypogyna, filamentis brevissimis applanatis inæqualibus vel subnullis, antheris globosis bilocularibus versatilibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile ovoideum obliquum triloculare, ovulis in loculo 2; styli 3 subulati falcati intus stigmatosi. *Fructus* ignotus.

1. C. japonica, *Maxim. loc. cit.*; *Franch. & Sav. Enum.* ii. 86.—Melanthium luteum, *Thunb. Fl. Jap.* 152.—M. japonicum, *Willd. in Berl. Mag.* ii. 22.—Helonias? japonica, *Schultes fil. Syst. Veg.* vii. 1567; *Kunth, Enum.* iv. 175.—Chamælirium luteum, *Miquel in Ann. Mus. Lug. Bat.* iii. 144, *non A. Gray*; *So Mokou Zoussetz,* vol. v. tab. 46. Herba glabra perennis erecta subpedalis, rhizomate perpendiculari præmorso cylindrico. Folia radicalia oblanceolata membranacea costata 2–4 poll. longa 6–9 lin. lata subpetiolata basi angustata utrinque viridia. Caulis gracilis, foliis multis parvis sessilibus lanceolatis instructus. Spica densa vel subdensa, florifera 1–3-pollicaris, 6–8 lin. diam. Bracteæ nullæ. Perianthii segmenta 3–4 lin. longa. *Japonia in aquosis ad Nagasaki,* Maximowicz! Capt. Blomfield! etc.

36. Veratrum (*Tourn.*), *Linn.*

Linn. Gen. No. 1146; *Endl. Gen.* No. 1067; *Kunth, Enum.* iv. 186.—Melanthium, *Thunb. Diss. Melanth., ex parte.*—Acedilanthus, *Trautt. et Meyer Fl. Ochot.* 94, t. 28.

Flores polygami multi imperfecti haud fructiferi. *Perianthium* 6-partitum persistens, segmentis subæqualibus multinervatis oblongis vel lanceolatis basi spathulatis facie haud foveolatis flore

expanso patulis. *Stamina* 6 hypogyna, filamentis filiformibus superne divergentibus quam segmenta sæpissime brevioribus, antheris reniformibus dorsifixis unilocularibus extrorsum dehiscentibus. *Ovarium* sessile liberum triloculare, ovulis in loculo crebris superpositis; styli 3 liberi subulati falcati apice stigmatosi. *Capsula* membranacea septicide trivalvis, seminibus multis planis alatis, testa laxa membranacea, albumine tenui, embryone minuto. *Herbæ perennes validæ erectæ, rhizomate crasso obliquo præmorso, caulibus foliatis, foliis sæpissime latis plicatis, floribus copiose paniculatis parvis albidis viridulis vel nigro-purpureis, rhachibus griseo-araneosis, bracteis parvis persistentibus.*

Stirps *V. albi*. Perianthium albidum vel viridulum.
Perianthii segmenta integra vel denticulata.
  Pedicelli floribus breviores .... 1. *V. album.*
  Pedicelli inferiores floribus longiores.
    2. *V. stamineum.* 3. *V. Maximowiczii.*
Perianthii segmenta margine fimbriata. ...... 4. *V. fimbriatum.*

Stirps *V. nigri*. Perianthium nigro-purpureum.
Folia inferiora oblonga.
  Perianthii segmenta oblonga haud unguiculata.
    5. *V. nigrum.*
  Perianthii segmenta oblanceolata unguiculata.
    6. *V. parviflorum.*
Folia inferiora oblanceolata.
  Racemi laxi, pedicellis flore longioribus.
    Perianthii segmenta basi obscure foveolata.
      7. *V. Maackii.*
    Perianthii segmenta basi haud foveolata. 8. *V. intermedium.*
  Racemi subdensi, pedicellis floribus brevioribus.
    9. *V. Woodii.*

1. V. ALBUM, *Linn. Sp.* 1479; *Jacq. Austr.* t. 335; *Schkuhr, Handb.* t. 341; *Red. Lil.* t. 447; *Fl. Dan.* t. 1120; *Hayne, Gewächse,* xiii. t. 26; *Kunth, Enum.* iv. 186; *Reich. Ic. Germ.* fig. 937. Herba perennis erecta 3–4-pedalis, rhizomate obliquo crasso præmorso, collo fibris coronato. Folia viridia firmula plicata subtus puberula, radicalia oblonga pedalia 5–6 poll. lata. Caulis validus puberulus, foliis 10–12 oblongis semipedalibus, superioribus lanceolatis. Panicula 1–2-pedalis, racemis densis rachibus pubescentibus, expansis 9–12 lin. diam., terminali elongato, lateralibus brevibus erecto-patentibus, pedicellis subnullis vel brevissimis, bracteis deltoideis minutis. Perianthium 4½–6 lin. longum, intus albidum, extus basi

viridulum, segmentis oblongo-spathulatis crispato-denticulatis 1½–2 lin. latis, venis 10–12 viridulis percursis, flore expanso patulis. Stamina segmentis subdimidio vel triente breviora. Capsula pollicaris, seminibus in loculo 10–12. *Montes Europæ continentalis et Sibiriæ occidentalis.*

Varietates insigniores sunt:—

i. V. LOBELIANUM, *Bernh. in Schrad. N. Journ.* 2, ii. 356; *Schult. fil. Syst.* vii. 155; *Reich. Ic. Germ.* fig. 938.—V. viride, *Roehl, Germ.* edit. ii. 237, *non Ait.*—V. album var. viridiflorum, *Mert. et Koch, Germ.* ii. 625. —V. album, var. virescens, *Gaud. Helv.* vi. 311. Perianthium extus et intus viridulum, segmentis angustioribus. Racemi laterales densi erecto-patentes, bracteis majoribus, interdum floribus æquilongis. Stamina perianthio duplo breviora. *Europa meridionalis, etc.* Forma Sibiriæ orientalis recedit racemis lateralibus longioribus laxioribus, floribus breviter pedicellatis. Forma japonica (*V. album,* var. *grandiflorum,* Maxim.) racemis elongatis laxifloris, pedicellis inferioribus 3–4 lin. longis, perianthii segmentis viridibus semipollicaribus.

ii. V. ESCHCHOLTZII, *A.Gray in Ann. Lyc. New York,* iv. 119; *Kunth, Enum.* iv. 188.—V. Lobelianum var. Eschcholtzianum, *Schultes fil. Syst.* vii. 1555.—V. parviflorum, *Bongard.* Raches paniculæ pubescentes. Racemi laterales densi sæpe reflexi nutantes. Perianthium viridulum 3–5 lin. longum. Stamina segmentis duplo breviora. *Ab Kamtschatka et Sitka ad Oregon et Alaskam.* Planta californica (V. californicum, *Durand,* Bolander 6255!) recedit racemis laxioribus floribus paulo majoribus; var. WATSONI, *Baker* (V. album, *S. Wats. Bot.* 40 *Parall.* 344, Nevada et Colorado) floribus ochroleucis. V. OXYSEPALUM, *Turcz.*; *Led. Ross.* iv. 209, est planta affinis a Kamtschatka floribus parvis, perianthii segmentis lanceolatis, bracteis pedicello brevi longioribus.

iii. V. VIRIDE, *Ait. Kew.* iii. 422; *A. Gray in Ann. Lyc. New York,* iv. 118; *Kunth, Enum.* iv. 188.—Helonias viridis, *Ker in Bot. Mag.* t. 1096, *excl. syn.*—Melanthium virens, *Thunb. Diss.* 4.—M. bracteolare, *Desv. in Lam. Ency.* iv. 26. Rami et folia subtus minus pubescentia. Racemi laterales laxiflori sæpe reflexi. Perianthium viridulum, segmentis lanceolatis acutis 1–1½ lin. latis. Pedicelli inferiores 2–3 lin. longi. Stamina segmentis paulo breviora. *America borealis orientalis a Canada ad Georgiam.*

2. V. STAMINEUM, *Maxim. Decad.* vii. 339; *Franch. et Savat. Enum.* ii. 90. Habitus omnino *V. albi.* Caulis bipedalis, infra paniculam calvatus. Folia inferiora oblonga plicata semipedalia utrinque viridia glabra, superiora oblongo-lanceolata. Panicula semipedalis, rachibus validis griseo-puberulis, racemis densis, expansis 10–12 lin. diam., pedicellis inferioribus 3–4 lin. longis, bracteis linearibus viridibus pedicello æquilongis. Perianthium viridulum 3 lin. longum, segmentis obovatis obtusis integris. Sta-

mina perianthio æquilonga vel demum exserta. *Japonia in Nippon centrali*, Tschonoski!

3. V. Maximowiczii, *Baker*.—V. album var. parviflorum, *Maxim. in Pl. Jap. iter secund.* Caulis basi incrassatus, tunicis in setas copiosas dissolutis, superne pubescens, sesquipedalis, foliis inferioribus oblongis semipedalibus vel ultra utrinque glabris viridibus, superioribus lanceolatis. Panicula pedalis et ultra, rachibus pubescentibus strictis, racemis laxiusculis, expansis 9–12 lin. diam., terminali elongato fructifero, lateralibus brevibus erecto-patentibus, pedicellis 3–4 lin. longis, bracteis lanceolatis pedicello subæquilongis. Perianthium viridulum 3 lin. longum, segmentis oblongis subacutis 1 lin. latis venis 6–7 laxis percursis. Stamina perianthio duplo breviora. Capsula semipollicaris. *Japonia in insula Nippon*, Tschonoski!

4. V. fimbriatum, *A. Gray*. Habitus *V. albi*. Folia inferiora oblongo-lanceolata pedalia et ultra medio 4–5 poll. lata utrinque viridia glabra, superiora lineari-lanceolata. Panicula pedalis, rachibus validis griseo-araneosis, racemis laxiusculis, expansis 12–15 lin. diam., lateralibus strictis erecto-patentibus, pedicellis inferioribus 2–3 lin. longis, bracteis ovatis brunneis pubescentibus pedicello subæquilongis. Perianthium 4½–5 lin. longum viridulum extus puberulum, segmentis rotundo-rhomboideis spathulatis flabellato-multinervatis margine fimbriatis flore expanso patulis. Stamina perianthio paulo breviora. *California in ditione Mendocino*, Bolander!

5. V. nigrum, *L. Sp.* 1479; *Jacq. Austr.* t. 336; *Red. Lil.* t. 416; *Bot. Mag.* t. 963; *Kunth, Enum.* iv. 186; *Reich. Ic. Germ.* fig. 939.—Melanthium nigrum, *Thunb. Diss.* 4.—Helonias nigra, *Ker in Journ. Sc.* ii. 184. Caulis basi leviter bulbosus, tunicis brunneis in fibras dissolutis. Folia inferiora oblonga pedalia plicata 6–8 poll. lata utrinque viridia glabra basi angustata haud distincte petiolata. Caulis validus strictus 2–3-pedalis, foliis inferioribus pluribus oblongis, supremis lanceolatis. Panicula angusta 1–3-pedalis, rachibus dense griseo-araneosis, racemis densifloris, expansis 9–12 lin. diam., lateralibus multis brevibus erecto-patentibus, pedicellis inferioribus 1 3 lin. longis, bracteis minutis deltoideis vel lanceolatis dorso araneosis. Perianthium nigro-purpureum 2–3 lin. longum, segmentis oblongis obtusis haud unguiculatis 1½ lin. latis flore expanso subreflexis. Stamina perianthio duplo breviora. Capsula glabra membranacea subpollicaris. *Europa centralis et orientalis in montibus et per Sibiriam ad Manchuriam.*

Var. japonicum, *Baker*. Habitus gracilior, racemis laxioribus, pedicellis longioribus infimis sæpe perianthium superantibus, floribus paucioribus majoribus. *Japonia*, Small! Maximowicz!

6. V. parviflorum, *Michx. Fl.* ii. 250; *A. Gray, Fl. N. States*, edit.

v. 525; *Chapm. Fl. S. States*, 489.—Melanthium monoicum, *Walt. Carol.* 120.—M. hybridum, *Nutt. Gen.* i. 232.—Leimanthium monoicum, *Schultes, Syst.* vii. 1550; *A. Gray in Ann. Lyc. New York*, iv. 116.—Zygadenus monœcus, *Kunth, Enum.* iv. 196. Caulis basi incrassatus, tunicis membranaceis. Folia inferiora oblonga semipedalia distincte petiolata medio 3–4 poll. lata vix plicata utrinque viridia glabra. Caulis strictus 2–3-pedalis, foliis inferioribus oblongis petiolatis, superioribus sessilibus lanceolatis. Panicula laxissima 1–2-pedalis, racemis laxifloris, expansis 9–12 lin. diam., lateralibus multis brevibus ascendentibus, rachibus omnium graduum griseo-araneosis, pedicellis inferioribus 3–4 lin. longis, bracteis minutis deltoideis vel lanceolatis. Perianthium viridulo-purpureum 3 lin. longum, segmentis oblanceolatis acutis 1 lin. latis leviter unguiculatis flore expanso patulis. Stamina minuta segmentis triplo breviora. Capsula membranacea semipollicaris. *America borealis orientalis in montibus Carolinæ et Virginiæ.*

7. V. Maackii, *Regel, Flor. Ussur.* 169, t. 11. figs. 8–14.—Zygadenus japonicus, *Miquel in Ann. Mus. Lug. Bat.* iii. 146.—V. nigrum, var. Maackii, *Maxim.* Caulis basi leviter incrassatus, tunicis in fibras dissolutis. Folia inferiora lanceolata semipedalia distincte petiolata medio 1 poll. lata plicata utrinque viridia. Caulis gracilis bipedalis superne araneosus, foliis paucis, inferioribus lanceolatis petiolatis, superioribus linearibus sessilibus. Panicula laxissima semipedalis vel pedalis, rachibus araneosis, racemis laxis expansis 9–12 lin. diam., lateralibus multis brevibus ascendentibus, pedicellis inferioribus 3–4 lin. longis, bracteis minutis lanceolatis vel deltoideis. Perianthium nigro-purpureum 2½–3 lin. longum, segmentis oblongis haud unguiculatis flore expanso reflexis basi nigrescentibus subfoveolatis. Stamina perianthio duplo breviora. Capsula membranacea semipollicaris. *Siberia orientalis in ditione fluminis Ussuri*, Maack! *Japonia in inundatis apertis*, Oldham 239! Maximowicz! Acedilanthus anticleoides, *Trautt. & Mey. Fl. Ochot.* 95, t. 28 (*Sibiria orientalis*, Middendorff!), est forma debilis glabra nemorosa perianthii segmentis viridulis.

8. V. intermedium, *Chapm. Fl. S. States*, 489. Caulis basi leviter incrassatus cylindricus, tunicis multis castaneis fibrosis. Folia inferiora oblongo-oblanceolata 6–9 poll. longa distincte petiolata vix plicata utrinque glabra viridia, medio 2–3 poll. lata. Caulis bipedalis et ultra modice validus tenuiter araneosus, foliis multis, inferioribus latis petiolatis, superioribus lanceolatis sessilibus. Panicula laxissima 2–3-pedalis, rachibus tenuiter araneosis, racemis laxifloris paucifloris, inferioribus erecto-patentibus elongatis compositis, pedicellis inferioribus 3–4 lin. longis, bracteis minutis deltoideis. Perianthium nigro-purpureum 4 lin. longum, segmentis oblongis obtusis 1½ lin. latis haud unguiculatis flore expanso patulis. Stamina perianthio paulo breviora. Carpella florifera puberula. *Florida*, Chapman!

9. V. Woodii, *Robbins*; *A. Gray, Fl. N. States*, edit. v. 525; *Chapm. Fl. S. States*, 489. Caulis basi leviter incrassatus, tunicis pluribus fibrosis brunneis. Folia inferiora lanceolata pedalia distincte petiolata haud plicata medio 1–1½ poll. lata utrinque viridia glabra. Caulis 2–3-pedalis calvatus strictus modice validus, foliis multis, inferioribus magnis lanceolatis petiolatis, superioribus reductis sessilibus. Panicula pedalis et ultra, rachibus tenuiter griseo-araneosis, racemis densifloris, expansis 9–12 lin. diam., multis, lateralibus brevibus erecto-patentibus, pedicellis inferioribus 1–2 lin. longis, bracteis minutis deltoideis. Perianthium 4 lin. longum, primum viridulum, maturum nigro-purpureum, segmentis oblanceolatis subacutis 1–1½ lin. latis flore expanso patulis. Stamina perianthio sub duplo breviora. Carpella florifera puberula, fructifera semipollicaria. *America borealis orientalis in montibus civitatum Indiana et Illinois*, Mead!

Species dubia.

V. Sabadilla, *Retz.*; *Descourt. in Mém. Soc. Linn. Par.* iii. t. 6, videtur ex plantis duabus commixtis descriptum et delineatum. Fructus et racemus verisimiliter ad *Schœnocaulon*; folium et flores cum staminibus ad *Veratrum nigrum* pertinent.

Species exclusæ.

V. Dubouzetii, Hombr. et Jacq. Atlas Voy. Astrol. Monoc. t. 4, = Anthericum Rossii, *Hook. fil.*

V. virescens, Martens et Galeotti, Enum. 9, = Anticlea mexicana.

V.? malayanum, Jack in Hook. Bot. Misc. ii. 74, = Veratronia malayana, *Miquel, Flor. Ned. Ind.* iii. 553, = Susum anthelminticum, *Blume.*

37. Melanthium (*Gronov.*), *Linn.*

Linn. Gen. No. 454; *A. Gray, Fl. N. States*, edit. v. 525, *non Schlecht. nec Kunth.*—Leimanthium, *Willd. in Berl. Mag.* ii. 24; *A. Gray in Ann. Lyc. New York*, iv. 115.—Zygadenus, *Kunth, Enum.* iv. 194, *ex parte.*

Flores polygami, multi imperfecti haud fructiferi. *Perianthium* corollinum 6-partitum, segmentis subæqualibus flore expanso patulis distincte unguiculatis et ad laminæ basin distincte foveolatis. *Stamina* 6 perigyna, filamentis divergentibus subulatis quam segmenta brevioribus, antheris peltatis unilocularibus dorsifixis extrorsum dehiscentibus. *Ovarium* liberum ovoideum triloculare, ovulis in loculo crebris superpositis; styli 3 liberi falcati subulati, apice capitato-stigmatosi. *Capsula* membranacea septicide trivalvis, seminibus compressis alatis appendiculatis, testa laxa membranacea, albumine tenui, embryone minuto. *Herbæ bulbosæ, foliis linearibus vel lanceolatis membranaceis glabris, caulibus*

laxe foliatis, superne cum rachibus pedicellisque pubescentibus, bracteis minutis navicularibus, floribus parvis ochroleucis copiose racemoso-paniculatis.

Segmentorum lamina oblonga ungue triplo longior.
1. *M. virginicum.*

Segmentorum lamina rotunda ungue subæquilonga.
2. *M. hybridum.*

1. M. VIRGINICUM, *Linn. Sp.* 483 (*Gronov. Virgin.* 59); *A. Gray. loc. cit.*—M. polygamum, *Desr. in Lam. Encyc.* iv. 25.—Zygadenus virginicus, *Endl. Gen.* 135; *Kunth, Enum.* iv. 195; *Torrey, New York,* ii. 316, t. 134.—Leimanthium virginicum, *Willd. & A. Gray, loc. cit.*—Helonias virginica, *Sims in Bot. Mag.* t. 985. Caulis basi parum bulbosus, tunicis superne fibrosis. Folia radicalia 4–6 linearia vel lanceolata pedalia vel sesquipedalia 6–18 lin. lata deorsum angustata subpetiolata. Caulis 3–4-pedalis, foliis multis reductis linearibus instructus. Panicula laxa pedalis et ultra, rachibus omnium graduum griseo-puberulis, racemis multis multifloris 15–18 lin. latis, lateralibus erecto-patentibus terminali brevioribus, pedicellis strictis 3–6 lin. longis, basi bractea minuta oblongo-lanceolata obtusa stipatis. Perianthium 4 lin. longum ochroleucum extus basi puberulum, segmentorum lamina ovato-oblonga 3 lin. longa basi glandulis binis nigris conspicuis foveolata, ungue lineari ½ lin. longo. Filamenta ad unguis apicem inserta lamina breviora. Capsula perianthio subæquilonga. *In pratis Americæ borealis orientalis a Novo Eboraco ad Floridam.*—M. BIGLANDULOSUM, *Bertol.*; *Walp. Ann.* iii. 649, ex descriptione non potui segregare.

2. M. HYBRIDUM, *Walt. Carol.* 125.—M. latifolium, *Desr. in Lam. Ency.* iv. 25.—M. monoicum, *Pursh, Flora,* i. 241.—M. racemosum, *Mich. Flora,* ii. 251.—Zygadenus hybridus, *Endl. Gen.* 135; *Kunth, Enum.* iv. 196.—Leimanthium hybridum, *Schultes, Syst.* vii. 1550. Habitus omnino *M. virginici* sed gracilior. Folia radicalia subpedalia superne 9–12 lin. lata. Panicula laxa pedalis, racemis multis 12–15 lin. latis, pedicellis 3–6 lin. longis, bracteis 1–1½ lin. longis ovato-lanceolatis stipatis. Perianthium 2½–3 lin. longum, segmentorum lamina rotunda 1–1½ lin. longa et lata basi glandula magna nigra foveolata. Stamina subhypogyna, filamentis perianthio duplo brevioribus. Capsula 4–5 lin. longa. *In pratis a Canada ad Alabamam et Georgiam.*

Species dubia.

M. ASPERICAULE, *Poir. Encyc. Méth. Suppl.* iii. 628.—Amianthium aspericaule, *A. Gray in Ann. Lyc. New York.* iv. 126.—Amiantanthus aspericaulis, *Kunth, Enum.* iv. 183. "Caulis (ima pars adest) sesquipedalis striatus trifoliatus pulverulento-scaber. Folia striata plana sensim

acuta (juniora subtus et margine puberula) glabra, basi latiora et semiamplectentia, infimum fere 6-unciale, superiora sensim breviora, summis ad bracteas diminutis. Panicula spiciformis tomentoso-puberula 2 unc. longa, e racemulis plurimis (superioribus confertis, imis longioribus et subdistantibus) 3–8-floris compositis. Flores inexpansi brevissime pedicellati, bractea cymbiformi ovata striata breviores, bracteola minima juxta perianthium muniti. Perianthii foliola (ante evolutionem) concava ovali-obovata basi subangustata nec unguiculata. Stamina basi perianthio inserta; antheræ magnæ extrorsæ uniloculares. Styli brevissimi."—*A. Gray, loc. cit.* *Prope Columbiam Carolinæ inferioris,* Curtis.

38. Schœnocaulon, *A. Gray.*

A. Gray in Ann. Lyc. New York. iv. 127; *Kunth, Enum.* iv. 185.—Asagrœa, *Lindl. in Bot. Reg.* 1839, t. 33; *Kunth, Enum.* iv. ~~t. 33.~~—Sabadilla, *Brandt in Hayne Gewächse,* xiii. sub t. 27.—Veratri *et* Heloniadis sp. *auctt.*

Flores polygami, multi superiores imperfecti haud fructiferi. *Perianthium* 6-partitum corollinum, segmentis lanceolatis subæqualibus obscure 3–5-nervatis flore expanso reflexis basi obscure foveolatis. *Stamina* 6 hypogyna, filamentis exsertis leviter applanatis flore expanso decurvatis, antheris minutis globosis unilocularibus peltatis extrorsum dehiscentibus. *Ovarium* liberum triloculare, ovulis in loculo paucis superpositis, stylis liberis falcatis subulatis apice stigmatosis. *Capsula* chartacea septicide trivalvis, seminibus compressis exalatis apice caudatis, testa laxa nitida castanea, albumine firmo, embryone minuto. *Herbæ bulbosæ, foliis omnibus radicalibus anguste linearibus elongatis firmis crebre nervatis, pedunculo nudo elongato, floribus parvis subspicatis viridulis vel flavidis minute bracteatis.*

Folia 3–6 lin. lata 20–30-nervata .... 1. *S. officinale.*
Folia 1–2 lin. lata 12–18-nervata.
2. *S. intermedium.* 3. *S. Drummondii.*
Folia angustissima 3–7-nervata.
4. *S. Coulteri.* 5. *S. gracile.*

1. S. officinale, *A. Gray in Benth. Pl. Hartweg.* 96; *Benth. & Trimen, Med. Plants,* t. 287.—Asagrœa officinalis, *Lindl. & Kunth, loc. cit.*—Veratrum officinale, *Schlecht. in Linnæa,* vi. 45; *Nees, Off. Pl. Suppl.* t. 6; *Brandt. & Ratzeb. in Hayne Gewächse,* xiii. t. 27.—Helonias officinalis, *Don in Edinb. New Phil. Journ.* 1832, 234.—Asagrœa caracasana, *Ernst in Seem. Journ.* ix. 91. Bulbus ovoideus 1–2 poll. diam., tunicis

brunneis supra collum longe productis in setas dissolutis. Folia radicalia 6–12 linearia firma 1½–4-pedalia costata deorsum 3–6 lin. lata 20–30-nervata. Scapus validus nudus 2–3-pedalis superne teres inferne angulatus. Spica densa cylindrica 6–12-pollicaris, diam. semipollicaris, bracteis minutis deltoideis viridibus. Perianthium flavidum 1½–2 lin. longum, segmentis lanceolatis. Filamenta straminea perianthio demum 1½–2plo longiora. Capsula 6 lin. longa, capsulis in stylos persistentes sensim attenuatis, seminibus castaneis 4 lin. longis. *In campis montium*: *Mexico,* Galeotti 5586! Schiede 982! Bourgeau 2282; *Guatemala,* Hartweg 627! Skinner! *Venezuela,* Moritz 910! Fendler 1506! Ernst 219!—A. CARICIFOLIAM, *Kunth, Enum.* iv. 666, Veratrum caricifolium, *Schlecht.*, ex descriptione non potui segregare.—A TENUIFOLIA, *Kunth, Enum.* iv. 700 (Veratrum tenuifolium, *Mart. & Gal.*), ab *officinali* dicitur recedere perianthii segmentis ovatis obtusis rubellis.

2. S. INTERMEDIUM, *Baker.* Bulbus ovoideus 7–8 lin. diam., tunicis brunneis supra collum 3–4 poll. productis in fibras subtiles solutis. Folia rigida anguste linearia sesquipedalia acuminata deorsum 1¼–2 lin. lata, 15–18-nervata. Scapus gracilis ½–1½-pedalis. Spica 3–8-pollicaris deorsum laxiuscula expansa 5–6 lin. diam. Perianthium viridulum 1 lin. longum. Filamenta straminea perianthio duplo longiora. Carpella fructifera 6–7 lin. longa, seminibus in loculo 2–3. *Mexico prope Zimapan,* Coulter 1568! 1570!

3. S. DRUMMONDII, *A. Gray in Hook. & Arn. Bot. Beech.* 388.—S. texanum, *Scheele in Linnæa,* xxv. 262. Bulbus ovoideus 1 poll. diam., tunicis productis in fibras subtiles solutis. Folia 6–8 anguste linearia sesquipedalia deorsum 1–1½ lin. lata, 12–15-nervata. Scapus gracilis 1–2-pedalis. Spica densa 3–6-pollicaris, expansa 6–7 lin. diam. Perianthium viridulum 1 lin. longum, segmentis ligulatis. Filamenta straminea perianthio 2–3plo longiora. Carpella fructifera 6 lin. longa, seminibus in loculo 4–5, 2 lin. longis. *Texas,* Drummond 284! Lindheimer, fasc. iv. No. 711! fasc. iii. No. 543.

4. S. COULTERI, *Baker.* Bulbum non vidi. Folia angustissima rigida subpedalia deorsum ½ lin. lata trinervata. Scapus teres gracillimus semipedalis. Spica subdensa 1–2-pollicaris, expansa 6–7 lin. diam. Perianthium viridulum 1–1¼ lin. longum, segmentis ligulatis. Filamenta straminea perianthio 2–3plo longiora. *Mexico prope Zimapan,* Coulter!

5. S. GRACILE, *A. Gray in Ann. Lyc. New York,* iv. 127; *Kunth, Enum.* iv. 185; *Chapm. Flor. S. U. States,* 490.—Helonias dubia, *Michx. Flora,* i. 213. Bulbus anguste ovoideus 2–12 lin. diam., tunicis brunneis superne in setas dissolutis. Folia 5–6 firma anguste linearia pedalia vel sesquipedalia deorsum ¾–1 lin. lata crebre 5–7-nervata. Scapus gracilis 1½–2-pedalis. Spica cylindrica 4–6-pollicaris, expansa 3–4 lin. diam.,

deorsum laxiuscula. Perianthium viridulum $\frac{3}{4}$–1 lin. longum. Filamenta perianthio duplo longiora. *Georgia et Florida in pinetis sabulosis,* Torrey! Leavenworth!

39. Amianthium, *A. Gray.*

A. Gray in Ann. Lyc. New York, iv. 121 (excl. sp.); *Endl. Gen.* No. 1066. 2.—Cyanotris, *Rafin. in Amer. Month. Mag.* 1809.—Chrosperma, *Rafin. Neogen.* 3.—Endocles, *Salisb. Gen.* 51.—Amiantanthus, *Kunth, Enum.* iv. 179.—Melanthii *et* Heloniadis sp. *auctt. vett.*

Flores hermaphroditi. *Perianthium* 6-partitum albidum marcescens, segmentis æqualibus oblongis obtusis laxe multinervatis flore expanso patulis vel reflexis neque foveolatis nec distincte unguiculatis. *Stamina* 6 hypogyna, filamentis subulatis perianthio æquilongis, antheris basifixis reniformibus unilocularibus superne ad marginem dehiscentibus. *Ovarium* sessile globosum vel oblongum triloculare, ovulis in loculo paucis, carpellis in stylos breves subulatos apice stigmatosos sensim angustatis. *Capsula* chartacea septicide trivalvis, seminibus sæpe solitariis oblongis vel cylindricis, testa crassa demum brunnea vel atra, albumine carnoso, embryone cylindrico. *Herbæ subbulbosæ, foliis pluribus radicalibus, rosulatis angustis planis, caulibus elongatis foliatis, floribus parvis copiosis simpliciter racemosis, pedicellis inarticulatis, bracteis persistentibus.*

Folia 3–9 lin. lata. Capsula perianthio æquilonga, seminibus oblongis.. 1. *A. Muscætoxicum.*
Folia 2–3 lin. lata. Capsula perianthio triplo longior, seminibus cylindricis .... 2. *A. angustifolium.*

1. A. Muscætoxicum, *A. Gray, loc. cit.*; *Fl. N. States,* edit. v. 526; *Chapm. Fl. S. States,* 490.—Melanthium Muscætoxicum, *Walt. Fl. Carol.* 125.—M. lætum, *Soland. in Ait. Hort. Kew.* i. 488.—M. phalangioides, *Desr. in Lam. Encyc.* iv. 27.—M. densum, *Desr. in Lam. Encyc.* iv. 66.—Leimanthium lætum et pallidum, *Willd. in Berl. Mag.* ii. 24.—Helonias læta, *Ker in Bot. Mag.* t. 803; *Lodd. Bot. Cab.* t. 998.—H. erythrosperma, *Michx. Fl.* i. 212.—Anthericum subtrigynum, *Jacq. Ic.* t. 419.—Melanthium myoctonum, *Gmel. Syst.* i. 587.—Amiantanthus Muscætoxicum, *Kunth, Enum.* iv. 180. Caulis basi hypogæa parum incrassata, tunicis multis fibrosis. Folia radicalia plura lineari-lorata membranacea subpedalia obtusa 3–9 lin. lata costata utrinque viridia. Caulis gracilis -2-pedalis, foliis paucis valde reductis præditus, superioribus minutis.

Racemus densus oblongus, floriferus 2–4 poll. longus, 12–18 lin. diam., pedicellis inferioribus 6–9 lin. longis, bracteis oblanceolato-spathulatis 1½–3 lin. longis. Perianthium 1½–2 lin. longum, segmentis ¾–1 lin. latis. Carpella fructifera perianthio subæquilonga. Semina in loculo sæpissime solitaria, testa carnosa rubella. *America borealis orientalis a Nova Cæsarea ad Floridam.*

2. A. ANGUSTIFOLIUM, *A. Gray, loc. cit.*; *Chapm. Flor. S. States*, 490.—Helonias angustifolia, *Michx. Flora*, i. 212.—H. læta, var. minor, *Ker in Bot. Mag.* t. 1540.—Amiantanthus angustifolius, *Kunth, Enum.* iv. 181. Caulis basi hypogæa vix incrassata. Folia radicalia subpedalia 2–3 lin. lata firmiora et magis distincte costata quam in *A. Muscætoxico.* Caulis gracilis pedalis vel sesquipedalis, foliis pluribus reductis instructus, superioribus minutis. Racemus floriferus 1–3 poll. longus, 9–12 lin. diam., pedicellis inferioribus 5–6 lin. longis, bracteis minutis oblanceolatis. Perianthium 1½–2 lin. longum, segmentis ½–¾ lin. latis. Carpella fructifera 4–4½ lin. longa. Semina cylindrico-triquetra 4 lin. longa. *America borealis orientalis a Carolina ad Floridam, in sylvis humidis.*

40. ZYGADENUS, *Rich.*

Rich. in Michx. Fl. Amer. i. 214, t. 22; *A. Gray in Ann. Lyc. New York.* iv. 111; *Kunth, Enum.* iv. 194, *ex parte.*—Chitonia, *Salisb. Gen.* 51.—Amianthium, *A. Gray in Ann. Lyc. New York,* iv. 121, *ex parte.*

Flores hermaphroditi. *Perianthium* 6-partitum corollinum, segmentis oblongis vel oblanceolatis æqualibus flore expanso patulis laxe multinervatis distincte vel obscure unguiculatis et facie supra unguem glandulis nectariferis foveolatis. *Stamina* 6 hypogyna, filamentis filiformibus vel leviter applanatis apice divergentibus, antheris parvis reniformibus basifixis demum unilocularibus secus marginem superiorem dehiscentibus. *Ovarium* sessile triloculare, ovulis in loculo pluribus superpositis; styli 3 liberi falcati subulati, stigmatibus capitatis. *Capsula* chartacea septicide trivalvis, seminibus in loculo paucis triquetris immarginatis vel anguste marginatis apice alatis, testa laxa brunnea, albumine carnoso, embryone cylindrico. *Herbæ glabræ bulbosæ vel rhizomatosæ, foliis radicalibus paucis linearibus, caulibus productis laxe foliatis, racemis sæpissime pluribus paniculatis, pedicellis solitariis inarticulatis, bracteis persistentibus, floribus parvis vel majoribus.*

§ *Euzygadenus.* Caulis basi rhizomatosus.

Species sola .... 1. *Z. glaberrimus.*

§§ *Chitonia*, Salisb. Caulis basi bulbosus.

Grandiflorus .... 2. *Z. Fremonti.*

Parviflori .... { 3. *Z. leimanthoides.* / 4. *Z. Nuttallii.* }

1. Z. GLABERRIMUS, *Michx. loc. cit.*; *Red. Lil.* t. 461; *A. Gray in Ann. Lyc. New York,* iv. 112; *Kunth, Enum.* iv. 194, excl. syn. Herba glaberrima perennis 2–3-pedalis, rhizomate repente. Folia basalia 4–5 linearia graminoidea acuminata pedalia vel sesquipedalia 3–4 lin. lata utrinque viridia. Caulis strictus, foliis pluribus plus minusve reductis in structus. Racemi multi laxi 5–10-flori laxe paniculati 1–2 poll. longi, pedicellis ascendentibus 3–6 lin. longis, bracteis parvis firmis lanceolatis cuspidatis. Perianthium 5–6 lin. longum, segmentis oblongis acutis distincte unguiculatis 2 lin. latis, flore expanso reflexis, supra unguem glandulis 2 nigris foveolatis. Filamenta subulata perianthio paulo breviora. Ovula in loculo 12–16. Styli 3 lin. longi. Capsulam non vidi. *America borealis orientalis in humidis a Virginia et Carolina ad Floridam.*

2. Z. FREMONTI, *Torrey*; *Wats. in Bot.* 40 *Parall.* 343; *Baker in Gard. Chron.* 1874, 66.—Z. glaberrimus, *Hook. & Arn. Bot. Beech.* 160, *non Michx.*—Z. Douglasii, *Torrey in Pacif. R. R. Surv.* vii. 20.—Anticlea Fremonti, *Torrey, Bot. Whipple,* 88. Bulbus ovoideus 8–12 lin. diam., tunicis castaneis membranaceis. Folia radicalia 3–4 linearia firmula pedalia vel sesquipedalia 3–4 lin. lata acuminata utrinque viridia. Caulis 1-1½-pedalis strictus, foliis paucis reductis instructus. Racemi corymbosi 2–4 poll. longi, expansi 2–3 poll. lati, simplices vel paniculati, pedicellis ascendentibus, inferioribus 1–2 poll. longis, bracteis lanceolatis 6–12 lin. longis. Perianthium 5–6 lin. longum, segmentis oblongis 1½–2 lin. latis obscure unguiculatis ad apicem unguis glandula magna viridula foveolatis. Stamina perianthio triente breviora. Styli pallidi 1 lin. longi. Carpella fructifera 9–12 lin. longa, seminibus in loculo 15–20 triquetris exalatis atris nitidis 2 lin. longis, *California et Montes Scopulosi,* Douglas! Coulter 746! Hartweg 2009! etc.

Var. MINOR, *Torrey.*—Zygadenus glaucus, *Nuttall in Herb. Kew. ex parte.* Semipedalis, foliis 2–3 lin. latis, racemo singulo paucifloro, floribus minoribus. *California et Montes Scopulosi,* Hartweg 1990!

3. Z. LEIMANTHOIDES, *A. Gray, Fl. N. States,* edit. v. 525; *Chapm. Fl. S. States,* 488.—Amianthium leimanthoides, *A. Gray in Ann. Lyc. New York,* iv. 125.—Amiantanthus limanthoides, *Kunth, Enum.* iv. 183. Caulis basi leviter bulbosus, tunicis brunneis membranaceis. Folia basalia 5–6 linearia graminoidea pedalia vel sesquipedalia 3–4 lin. lata. Caulis gracilis 2–3-pedalis, foliis paucis reductis instructus. Racemi multi 2–3 poll. longi 9–12 lin. lati laxe paniculati, pedicellis inferioribus 5–6 lin. longis, bracteis lanceolatis minutis. Perianthium 2 lin. longum, segmentis oblongis obscure unguiculatis basi distincte foveolatis. Filamenta

subulata perianthio distincte breviora. Ovula in loculo 8–10. Semina in loculo circiter 4 lanceolata anguste marginata apice alata. *America borealis orientalis in paludosis a Nova Cæsarea ad Carolinam et Novum Aurelianum.*

4. Z. Nuttallii, *A. Gray, Fl. N. States,* edit. v. 525; *S. Wats. Bot. 40 Parall.* 348.—Amianthium Nuttallii, *A. Gray in Ann. Lyc. New York,* iv. 123.—Amiantanthus Nuttallii, *Kunth, Enum.* iv. 181.—Anticlea Nuttallii, *Torrey, Bot. Whipple,* 88.—Helonias angustifolia, *Nutt. in Trans. Amer. Phil. Soc.* ser. 2, v. 154, *non Michx.* Bulbus globosus venenatus 6–12 lin. crassus, tunicis brunneis membranaceis. Folia radicalia 4–6 firma linearia pedalia vel sesquipedalia 3–6 lin. lata. Caulis ½–1½-pedalis, foliis paucis reductis instructus. Racemus sæpissime simplex superne densus 2–3 raro 4–6 poll. longus, expansus 1–1½ poll. diam., pedicellis ascendentibus, inferioribus 6–9 lin. longis, bracteis scariosis pallidis lanceolatis acuminatis pedicellis sæpe æquilongis. Perianthium 1½–3 lin. longum, segmentis oblanceolatis obscure unguiculatis et foveolatis. Filamenta perianthio æquilonga deorsum applanata. Ovula in loculo 12–14. Styli pallidi ½ lin. longi. Carpella fructifera 5–6 lin. longa, seminibus 2–2½ lin. longis anguste alatis apice appendiculatis. *Columbia britannica et California ad Texas et Arkansas in pratis, in montibus Scopulosis ad 6000 pedes ascendens.*

Var. Z. paniculatus, *S. Wats. in Bot. 40 Parall.* 343.—Helonias paniculata, *Nutt. in Journ. Acad. Phil.* vii. 57. Robustior, foliis 6–8 lin. latis, racemis pluribus laxe paniculatis, capsulis 6–12 lin. longis, seminibus 3–5 lin. longis. *California et Montes Scopulosi.*

41. Anticlea, *Kunth.*

Kunth, Enum. iv. 191.—Zygadenus, *A. Gray in Ann. Lyc. New York,* iv. 111, *ex parte.*—Monadenus, *Salisb. Gen.* 51.—Melanthii sp., *Linn.*

Flores hermaphroditi. *Perianthium* basi gamophyllum obconicum ovario adnatum, segmentis æqualibus lanceolatis vel oblongis multinervatis basi distincte foveolatis flore expanso patentibus vel reflexis. *Stamina* 6 perigyna, filamentis productis filiformibus apice divergentibus, antheris reniformibus unilocularibus margine dehiscentibus. *Ovarium* triloculare basi perianthio adnatum, ovulis in loculo pluribus superpositis; styli 3 liberi subulati falcati stigmatibus capitatis. *Capsula* chartacea septicide trivalvis, seminibus multis planiusculis anguste marginatis apice appendiculatis, testa laxa brunnea, albumine tenui, embryone minuto. *Herbæ bulbosæ, habitu omnino* Zygadeni; *solum recedunt perianthio basi gamophyllo ovario adnato.*

Robustiores, perianthii segmentis oblongis 1½–2 lin. latis.
  Flores ascendentes .... 1. *A. glauca.*
  Flores cernui .... 2. *A. volcanica.*
Graciliores, perianthii segmentis ½ lin. latis.
  Stamina inclusa .... 3. *A. sibirica.*
  Stamina exserta .... 4. *A. mexicana.*

1. A. GLAUCA, *Kunth, Enum.* iv. 192; *Led. Ross.* iv. 207.—Zygadenus glaucus, *Nutt. in Journ. Acad. Phil.* vii. 56; *A. Gray in Ann. Lyc. New York,* iv. 113; *S. Wats. Bot.* 40 *Parall.* 343.—Z. chloranthus, *Richards. in App. Frank. Journ.* edit. ii. 12; *Schultes fil. Syst.* vii. 156.—Z. commutatus *et* bracteatus, *Schultes fil. loc. cit.*—Z. canadensis *hort.*—Z. speciosus, *Dougl. MSS.*—Z. elegans, *Pursh, Fl.* i. 241; *Kunth, Enum.* iv. 197.—Melanthium Hultgreenii, *Soland. MSS.*; *Thunb. in Mus. Ac. Ups. App.* xxvi. 47.—Melanthium glaucum, *Nutt. Gen.* i. 232.—Leimanthium glaucum, *Schultes fil. Syst. Veg.* vii. 1551.—Helonias bracteata, *Sims in Bot. Mag.* t. 1703.—H. glaberrima, *Sims in Bot. Mag.* t. 1680, *excl. syn.* Bulbus ovoideus 6–12 lin. diam., tunicis membranaceis brunneis superne fibrosis. Folia radicalia 4–6 firma linearia glauco-viridia crebre nervata semipedalia ad sesquipedalia 3–6 lin. lata. Caulis ½–2-pedalis strictus, foliis paucis reductis præditus. Racemi laxi 2–4 poll. longi, expansi 1–2 poll. lati simplices vel multi laxe paniculati, pedicellis ascendentibus 6–12 lin. longis, bracteis lanceolatis pallidis subscariosis 3–9 lin. longis. Perianthium 5–6 lin. longum, basi obconica ovario adnata, segmentis oblongis crebre nervatis 1½–2 lin. latis albidis dorso viridibus basi glandula magna emarginata viridi foveolatis. Stamina perianthio paula breviora. Styli uncinati patuli 1½ lin. longi. Ovula in loculo 20 vel plura. Capsula 8–9 lin. longa, seminibus subcompressis pallide brunneis 2½ lin. longis. *America borealis a sinu Kotzebue, Columbia et California ad Canadam superiorem et Mexico Novum, in Montibus Scopulosis ad* 8000–9000 *pedes ascendens.*

2. A. VOLCANICA, *Baker.*—Zygadenus volcanicus, *Benth. Pl. Hartweg.* 96; *Kunth, Enum.* iv. 198. Bulbus ovoideus 15–18 lin. diam., tunicis membranaceis superne fibrosis supra collum longe productis. Folia radicalia 5–6 firma glabra lineari-lorata sesquipedalia 6–9 lin. lata. Caulis robustus strictus 2–3-pedalis, foliis paucis reductis instructus. Panicula laxa pedalis et ultra, ramis ascendentibus laxe racemosis, pedicellis floriferis cernuis 6–9 lin. longis, bracteis lanceolatis 3–6 lin. longis. Perianthium 4½–5 lin. longum, basi obconica ovario adnata, segmentis oblongis albidis extus viridulis 7–8-nervatis 1½ lin. latis, basi glandula magna viridula foveolatis. Genitalia segmentis distincte breviora. Capsula ignota. *Guatemala ad Volcan de Agua, alt.* 11000 *pedum,* Hartweg 626!

3. A. SIBIRICA, *Kunth, Enum.* iv. 191; *Led. Ross.* iv. 207.—Melanthium sibiricum, *Linn. Amœn. Acad.* 349, t. 11 (*Gmel. Sib.* i. 45, t. 8); *Sp. Plant.* 383.—Zygadenus sibiricus, *A. Gray in Ann. Lyc. New York*, iv. 112.—Leimanthium sibiricum, *Schultes fil. Syst. Veg.* vii. 1551.—Anthericum Gmelinianum, *Schultes fil. Syst.* vii. 481. Bulbus ovoideus 3–4 lin. diam., tunicis brunneis membranaceis. Folia radicalia 3–4 linearia graminoidea 6–9 poll. longa 2–3 lin. lata. Caulis gracilis semipedalis vel pedalis, folio unico reducto instructus. Racemi laxissimi pauciflori simplices vel parce paniculati 1–3 poll. longi, expansi 9–12 lin. lati, pedicellis ascendentibus 3–9 lin. longis, bracteis minutis lanceolatis viridibus. Perianthium luteo-viridulum 3–4 lin. longum, basi obconica ovario adnata, segmentis linearibus acutis flore expanso reflexis basi glandula magna viridula foveolatis. Genitalia segmentis distincte breviora. Ovula in loculo circiter 20. Capsulam non vidi. *Sibiria altaica, baicalensis et orientalis.*

4. A. MEXICANA, *Kunth, Enum.* iv. 193.—Helonia virescens, *H. B. K. Nov. Gen.* i. 267; *Schultes fil. Syst. Veg.* vii. 1564.—Veratrum virescens, *Mart. et Gal. Enum.* 10; *Kunth, Enum.* iv. 698. Bulbus ovoideus 6–9 lin. diam., tunicis membranaceis. Folia radicalia 4–5 firmula linearia glabra subpedalia 3–6 lin. lata. Caulis gracilis pedalis vel sesquipedalis, foliis 2–3 reductis instructus. Panicula laxissima subpedalis, racemis centralibus 4–6 poll. longis, 1½–2 poll. latis, pedicellis floriferis 6–12 lin. longis ascendentibus apice cernuis, bracteis lanceolatis viridibus 3–6 lin. longis. Perianthium flavo-viridulum 3–4 lin. longum, basi obconica ovario adnata, segmentis oblanceolatis ½ lin. latis dorso viridibus basi glandula viridula foveolatis. Genitalia exserta. Fructus ignotus. *Mexico ad montes, alt.* 8000–9000 *pedum ascendens,* Galeotti 5584! Coulter 1563! Andrieux 70! Jurgensen 821! etc.

42. STENANTHIUM, *Kunth.*

Kunth, Enum. iv. 189; *A. Gray, Fl. N. States*, edit. v. 525.—Veratrum *et* Stenanthium, *A. Gray in Ann. Lyc. New York*, iv. 120.—Heloniadis sp., *Ker.*—Veratri sp. *auctt.*

Flores polygami vel hermaphroditi. *Perianthium* corollinum persistens basi ovario adnatum, segmentis 6 lanceolatis acutis æqualibus 3–7-nervatis flore expanso falcatis neque unguiculatis nec foveolatis. *Stamina* 6 perigyna, filamentis subulatis segmentis 2–4plo brevioribus, antheris minutis globosis unilocularibus extrorsum margine dehiscentibus. *Ovarium* triloculare basi adnatum, ovulis in loculo multis superpositis, carpellis in stylos subulatos apice stigmatosos sensim attenuatis. *Capsula* membranacea septicide trivalvis, seminibus angustis plus minus compressis alatis et alato-appendiculatis, testa pallida laxa membranacea, albumine tenui, embryone minuto. *Herbæ glabræ bulbosæ, foliis*

radicalibus paucis linearibus, caulinis reductis, racemis laxis sæpissime paniculatis, bracteis persistentibus, floribus parvis vel magnitudine mediocribus albidis, viridibus vel purpureis.

Parviflorum, floribus permultis imperfectis... 1. *S. angustifolium.*
Grandiflora, floribus omnibus summis racemorum exceptis hermaphroditis fructiferis.
Perianthium saturate purpureum .... 2. *S. frigidum.*
Perianthium viridulum vel purpurascens.
Bracteæ pedicellis breviores .... 3. *S. occidentale.*
Bracteæ pedicellis longiores .... 4. *S. sachalinense.*

1. S. ANGUSTIFOLIUM, *Kunth, Enum.* iv. 190; *A. Gray, Fl. N. States,* edit. v. 525; *Chapm. Fl. S. States,* 489.—Veratrum (Stenanthium) angustifolium, *A. Gray in Ann. Lyc. New York.* iv. 120.—V. angustifolium, *Pursh, Flora,* i. 242. Bulbus anguste ovoideus 1 poll. diam., tunicis supra collum longe productis in fibras multas dissolutis. Folia radicalia plura linearia firmula obtusiuscula sesquipedalia vel bipedalia 4–6 lin. lata. Caulis strictus 2–3-pedalis, foliis pluribus consimilibus reductis instructus. Panicula pedalis vel sesquipedalis, racemo elongato terminali cylindrico fructifero 6–9 poll. longo, racemis multis lateralibus paucifloris ascendentibus floribus sæpissime imperfectis, pedicellis brevissimis, bracteis minutis linearibus. Perianthium albidum 3–4 lin. longum, segmentis lanceolatis trinervatis. Stamina minutissima segmentis 3–4plo breviora. Capsula 6 lin. longa, seminibus in loculo 5–6 pallidis lanceolatis 4 lin. longis. *America borealis orientalis in umbrosis ab Ohio ad Floridam.*

Var. S. GRAMINEUM, *Kunth, Enum. loc. cit.*—Helonias graminea, *Ker in Bot. Mag.* t. 1599.—Xerophyllum gramineum, *Nutt. Gen.* i. 235. Minor, foliis angustioribus, floribus paucioribus. *Georgia et Carolina,* Curtis!

2. S. FRIGIDUM, *Kunth, Enum.* iv. 190; *Flore des Serres,* v. 468 L.—Veratrum frigidum, *Cham. et Schlecht. in Linnæa,* vi. 46; *Benth. Pl. Hartweg.* 53. Bulbus anguste ovoideus 1 poll. diam., tunicis membranaceis pallidis supra collum longe productis apice in fibras dissolutis. Folia radicalia 5–6 firma linearia glabra acuta bipedalia 6–8 lin. lata. Caulis 2–3-pedalis, foliis paucis reductis instructus. Panicula laxa pedalis, floribus omnibus summis exceptis hermaphroditis fructiferis, racemis lateralibus ascendentibus paucifloris subsecundis, pedicellis cernuis 3–6 lin. longis, bracteis lanceolatis scariosis pedicello longioribus. Perianthium saturate purpureum 6–8 lin. longum, segmentis lanceolatis. Stamina segmentis triplo breviora. Capsula perianthio æquilonga, seminibus in loculo 10–12-linearibus pallidis 3 lin. longis. *Mexico in montibus ditionis Vera*

Cruz, etc., alt. 9000–12500 *pedum,* Galeotti 5583! Hartweg 402! Linden 57! etc.

3. S. OCCIDENTALE, *A. Gray in Proc. Amer. Acad.* 1872, 405. Bulbus ovoideus 3–12 lin. diam., tunicis membranaceis. Folia radicalia 2–4 linearia vel lanceolata acuta membranacea glabra viridia semipedalia ve pedalia medio 3–12 lin. lata e medio ad basin angustata. Caulis gracilis semipedalis vel pedalis, foliis 1–2 valde reductis instructus. Racemi laxissimi 4–12-flori 2–4 poll. longi simplices vel pauci laxe paniculati, pedicellis apice cernuis 6–12 lin. longis, bracteis lanceolatis viridibus 4–6 lin. longis. Flores omnes summis racemorum exceptis hermaphroditi fructiferi. Perianthium 6 lin. longum viridulum vel purpurascens, segmentis lanceolatis 5–7-nervatis superne flore expanso falcatis. Stamina segmentis duplo breviora. Capsula 6–8 lin. longa, stylis persistentibus 3–4 lin. longis, seminibus in loculo 8–10 linearibus alatis pallidis 3 lin. longis. *Montes Scopulosi Americæ borealis in ditione Oregon etc., alt.* 4000–6000 *pedum,* Lyall! Bourgeau! Hall 535!

4. S. SACHALINENSE, *F. Schmidt, Fl. Sachal.* 188. Bulbus anguste ovoideus 3–4 lin. diam., tunicis membranaceis. Folia radicalia 3–4 membranacea viridia glabra acuta sesquipedalia 3–4 lin. lata. Caulis gracilis semipedalis, folio unico valde reducto præditus. Racemus simplex laxissimus 3–5-florus, pedicellis 3–6 lin. longis apice cernuis, bracteis lanceolatis viridibus pedicello longioribus. Perianthium viridulum vel purpurascens 6 lin. longum, segmentis lanceolatis 5-nervatis flore expanso superne falcatis. Stamina segmentis triplo breviora. Capsula perianthio æquilonga, seminibus in loculo 6–8 lanceolatis alatis. *Insula Sachalin,* F. Schmidt! Ad *S. occidentalem* arcte accedens.

43. TOFIELDIA, *Huds.*

Huds. Fl. Angl. 157; *Endl. Gen.* No. 1062; *Kunth, Enum.* iv. 165.—Heritiera, *Schrank, Bar.* 580.—Hebelia, *Gmel. Bad.* ii. 117.—Isidrogalvia, *Ruiz & Pavon, Fl. Peruv.* iii. 69, tab. 302. —Conradia, *Rafin. Neog.* 3.—Antherici *et* Narthecii sp. *auctt. vett.*

Flores hermaphroditi. *Perianthium* firmulum 6-partitum persistens, segmentis subæqualibus oblanceolatis obtusis flore expanso patulis. *Stamina* 6 subhypogyna, filamentis filiformibus vel leviter applanatis perianthio sæpissime subæquilongis, antheris subglobosis bilocularibus apiculatis basi emarginatis versatilibus supra basin affixis vel basifixis, introrsum longitudinaliter dehiscentibus. *Ovarium* sessile triloculare, ovulis in loculo crebris; stylis sæpissime ab initio liberis, apice capitato-stigmatosis.

Capsula membranacea septicido-trivalvis, seminibus minutissimis oblongis turgidis ecaudatis leviter curvatis, testa brunnea membranacea, albumine carnoso, embryone minuto. *Herbæ cæspitosæ sæpissime glabræ, foliis pluribus radicalibus linearibus distichis equitantibus, caulibus productis foliis 2–3 reductis sæpissime instructis, floribus parvis racemosis vel subspicatis, pedicellis basi bracteatis et sæpe etiam ad apicem bracteolis tribus calyculatis.*

§ Tofieldia vera. Styli floriferi discreti. Perianthium parvum, segmentis 1- raro 3-nervatis.

Calyculus nullus .... 1. *T. palustris.*

Perianthium basi calyculo trilobato præditum.

Pedicelli floriferi brevissimi vel subnulli.

2. *T. calyculata.* 3. *T. nutans.*

Pedicelli floriferi perspicui cernui.

4. *T. cernua.* 5. *T. sordida.* 6. *T. stenantha.*

Pedicelli floriferi perspicui ascendentes.

Asiaticæ ... 7. *T. nuda.* 8. *T. gracilis.* 9. *T. himalaica.*

Americana .... 10. *T. glabra.*

§§ Isidrogalvia. Styli floriferi concreti. Perianthium majus, segmentis 5–7-nervatis.

Species sola .... 11. *T. falcata.*

1. T. palustris, *Huds. Fl. Angl.* 157; *Engl. Bot.* t. 536; *Smith in Trans. Soc. Linn.* xii. 239; *Hook. Fl. Lond.* t. 100; *A. Gray in Ann. Lyc. New York,* iv. 134; *Kunth, Enum.* iv. 166.—T. borealis, *Wahl. Lapp.* 89.—T. pusilla, *Pers. Syn.* i. 399; *Willd. in Berl. Mag.* ii. 28.—Anthericum calyculatum, *Linn. Sp.* edit. ii. 447, *ex parte*; *Œder, Fl. Dan.* t. 36; *Smith, Fl. Lapp.* tab. 10. fig. 3.—Narthecium pusillum, *Michx. Fl. Bor.-Am.* i. 209.—N. boreale, *Wahl. in Nova Act. Holm.* xxvi. 24. Folia radicalia anguste linearia 1–1½ poll. longa 1 lin. lata 3–5-nervia, margine scabra. Caulis gracilis glaber flexuosus 3–6-pollicaris, foliis 1–2 reductis navicularibus prope basin instructus. Racemus floriferus subspicatus capitatus 3–6 lin. longus, expansus 2–3 lin. diam., floribus 1–2 infimis sæpe segregatis, pedicellis subnullis vel brevissimis, basi bracteis tribus deltoideis connatis instructis, apice haud calyculatis. Racemus fructiferus laxior, pedicellis ascendentibus, infimis ½–1 lin. longis. Perianthium campanulatum luteo-viridulum ¾–1 lin. longum, segmentis oblanceolatis uninervatis. Stamina segmentis subæquilonga, antheris globosis versatilibus. Capsula subglobosa 1 lin. longa, stylis brevissimis, seminibus in loculo multis brunneis oblongo-triquetris ¼–⅙ lin. longis. *Zona arctica et montes zonæ borealis temperatæ totius orbis in paludosis.*

2. T. calyculata, *Wahl. Helv.* 68; *Led. Ross.* iv. 210; *Kunth, Enum.*

iv. 167.—T. alpina, *Smith in Trans. Linn. Soc.* xii. 241.—T. stenopetala, *Smith in Trans. Linn. Soc.* xii. 243, t. 8. fig. 1; *Kunth, Enum.* iv. 169.—T. glacialis, *Gaud. Helv.* ii. 596; *Kunth, loc. cit.*—T. palustris, *DC. Fl. France,* No. 1894; *Red. Lil.* t. 256, *non Huds.*—T. anthericoides, *Roth, Enum.* i. 2, 109.—T. allemanica, *Bluff et Fingerhuth, Germ.* 478.—T. rubra, *Braun in Bot. Zeit.* 1820, 496.—Anthericum calyculatum, *Linn. Sp.* edit. ii. 447, *ex parte.*—Narthecium calyculatum, *All. Ped.* ii. 165. —N. iridifolium, *Vill. Delph.* ii. 225.—Helonias borealis, *Willd. Sp.* ii. 274. Hebelia allemanica *et* collina, *Gmel. loc. cit.*—Anthericum pseudo-asphodelus, *Jacq. Vind.* 233.—Scheuchzeria pseudo-asphodelus, *Scop. Carn.* i. 263. Folia 2–6 poll. longa $1\frac{1}{2}$–3 lin. lata 6–10-nervata. Caulis semipedalis vel pedalis glaber, foliis 2–3 reductis navicularibus erectis præditus. Racemus floriferus subspicatus $\frac{1}{2}$–3 poll. longus, expansus $4\frac{1}{2}$–6 lin. diam., floribus omnibus confertis vel inferioribus segregatis, pedicellis nullis vel brevissimis, basi bractea minuta deltoidea, apice calyculo viridulo dentibus inæqualibus instructis. Perianthium luteo-viridulum 1 lin. longum, segmentis oblanceolatis vel oblongis obtusis 1-nervatis. Stamina perianthio æquilonga vel breviter exserta, antheris luteis leviter versatilibus. Racemus fructiferus 1–6-pollicaris, pedicellis ascendentibus, inferioribus 1–$1\frac{1}{2}$ lin. longis. Capsula subglobosa $1\frac{1}{2}$–2 lin. longa, stylis $\frac{1}{4}$ lin. longis, seminibus in loculo permultis. *Montes Europæ et Siberiæ ad Kamtschatkam et Americam borealem.*

T. RACEMOSA, *Hoppe,* est forma elata pedalis vel sesquipedalis, racemo florifero 2–3 poll. longo superne laxo, pedicellis perspicuis; T. GLACIALIS, *Gaud.*, est forma pygmæa subpollicaris floribus paucis capitatis; T. COCCINEA, *Richard, Kunth, Enum.* iv. 167, et T. RUBRA, *Braun,* formæ racemo capitato, bracteis, perianthii segmentis antherisque rubellis.

3. T. NUTANS, *Willd.*; *Led. Ross.* iv. 210; *Turcz. Fl. Baic.* ii. 231; *Maxim. Decad.* iii. 212. Folia radicalia 1–2 poll. longa 1–2 lin. lata 5–7-nervata. Caulis glaber 2–4-pollicaris, foliis 2–3 reductis, supremo sæpe supra medium imposito, præditus. Racemus floriferus subspicatus capitatus 4–6 lin. longus, pedicellis nullis vel brevissimis, basi bractea deltoïdea, apice calyculo irregulariter trilobato præditis. Racemus fructiferus 6–9 lin. longus, pedicellis cernuis 1–$1\frac{1}{2}$ lin. longis. Perianthium $\frac{3}{4}$–1 lin. longum luteo-viridulum vel rubro tinctum, segmentis oblanceolatis obtusis 1-nervatis. Stamina leviter exserta, antheris luteis versatilibus. Capsula globosa perianthio æquilonga, stylis $\frac{1}{4}$ lin. longis, seminibus in loculo pluribus pallide brunneis. *Siberia orientalis,* Turczaninow! Small! *Japonia,* Tschonski! *America borealis ad ripas fluminis MacKenzie,* Dr. Richardson! T. COCCINEA, var. MAJOR, *Hook. Fl. Bor.-Am.* ii. 179, est forma perianthio rubello.

4. T. CERNUA, *Smith in Trans. Linn. Soc.* xii. 244; *Kunth, Enum.* iv. 170; *Led. Ross.* iv. 210; *Maxim. Decad.* iii. 212. Folia radicalia 2–3

poll. longa 1–1½ lin. lata 5–7-nervata. Caulis gracilis glaber 6–9-pollicaris, foliis omnibus basalibus vel unico supra basin præditus. Racemus floriferus laxus 1–2-pollicaris expansus 6 lin. diam., pedicellis cernuis 1–1½ lin. longis, basi bractea minuta deltoidea, apice calyculo viridulo præditis. Racemus fructiferus laxior, pedicellis flore subæquilongis. Perianthium 1½ lin. longum, segmentis flavidis oblanceolatis uninervatis. Stamina perianthio æquilonga vel breviter exserta, antheris luteis versatilibus. Capsula obovoidea 2 lin. longa perianthio accreto æquilonga, stylis ¼ lin. longis, seminibus in loculo multis. *Siberia orientalis*, Pallas! Turczaninow! etc.

5. T. SORDIDA, *Maxim. Diag. Decad.* iii. 212; *Franch. et Sav. Enum. Jap.* ii. 89, 532. Folia radicalia anguste linearia 5-nervata. Caulis subunifolius foliis paulo longior. Racemus floriferus pedicellis perspicuis cernuis perianthio paulo brevioribus, basi bractea deltoidea pedicello æquilonga, apice calyculo æqualiter trilobato præditis. Perianthium cylindricum sordide ochraceum, segmentis lineari-oblongis, exterioribus trinervatis, interioribus uninervatis. Stamina perianthio æquilonga, antheris basifixis. Styli ovario æquilongi. *Japonia in alpibus ditionis Yedo,* Maximowicz.

6. T. STENANTHA, *Franch. et Savat. Enum. Jap.* ii. 530.—T. nuda, *Franch. et Savat. Enum. Jap.* ii. 89, *ex parte, non Maxim.* Folia radicalia anguste linearia valide 3–5-nervata margine scabra. Caulis gracilis glaber flexuosus 1–3-folius. Racemus floriferus brevis laxus, pedicellis floriferis cernuis perianthio fere æquilongis, basi bractea ovata interdum trilobata, apice calyculo oblique truncato præditis. Perianthium olivaceum subcylindricum, segmentis oblanceolatis ascendentibus 1-nervatis. Stamina inclusa, antheris ovoideis luteis basifixis. Ovarium obovoideum substipitatum, stylis ovario æquilongis. Semina in loculo solitaria. *Japonia in locis humidis umbrosis tractus Hakone,* Savatier 1235.

7. T. NUDA, *Maxim. Decad.* x. 416; *So Mokou Zoussetz,* vol. vii. t. 29; *Franch. et Savat. Enum. Jap.* ii. 89, *ex parte.* Folia radicalia linearia 4–5 poll. longa 2 lin. lata trinervata. Caulis glaber nudus foliis duplo longior. Racemus floriferus laxus 2–3-pollicaris, pedicellis ascendentibus 2–3 lin. longis, basi vix bracteatis, apice bracteola minutissima uninervata obsolete tricuspidata præditis. Perianthium campanulatum albidum 1 lin. longum, segmentis oblanceolatis uninervatis. Stamina perianthio æquilonga, antheris rubellis versatilibus. Styli ovario oblongo sessili triplo breviores. *Japonia.*

8. T. GRACILIS, *Franch. et Savat. Enum. Jap.* ii. 89, 531. Folia radicalia anguste linearia 3–5-nervia scapo vix breviora, margine scabra. Caulis gracilis flexuosus glaber nudus vel unifolius. Racemus floriferus laxus pedicellis solitariis, vel densior pedicellis 2–4nis ascendentibus perianthio subæquilongis, bractea ovata pedicello æquilonga, apice calyculo

trilobato præditis. Perianthium albidum campanulatum, segmentis oblongis flore expanso patulis. Stamina exserta, antheris ovoideis violaceis basifixis. Styli graciles ovario æquilongi. *Japonia in montibus Nippon borealis,* Savatier 3749.

9. T. HIMALAICA, *Baker.* Folia radicalia anguste linearia 2–4 poll. longa 1–2 lin. lata 3–5-nervata, margine scabra. Caulis gracilis glaber semipedalis, foliis 1–2 lanceolato-navicularibus supra basin præditus. Racemum floriferum non vidi. Racemus fructiferus laxus 2–4-pollicaris, pedicellis ascendentibus, inferioribus 4–6 lin. longis, basi bractea minuta lanceolata vel oblanceolata, apice calyculo viridulo præditis. Perianthium luteo-viridulum $1\frac{1}{2}$ lin. longum, segmentis anguste oblanceolatis uninervatis. Stamina breviter exserta. Capsula obovoidea 2 lin. longa, stylis $\frac{1}{2}$–$\frac{3}{4}$ lin. longis. *Himalaya orientalis in regione alpina ditionis Sikkim, alt.* 10000–15000 *pedum,* Sir J. D. Hooker!

10. T. GLABRA, *Nutt. Gen.* i. 235; *A. Gray in Ann. Lyc. New York.* iv. 170; *Kunth, Enum.* iv. 170; *Chapm. Flor. S. States,* 492.—T. glaberrima, *Macbride in Ell. Bot.* i. 424. Folia radicalia linearia rigidula semipedalia vel pedalia 2–3 lin. lata 6–12-nervata. Caulis strictus glaber 1–2-pedalis, foliis 3–4 erectis reductis præditus. Racemus floriferus densus 2–6 poll. longus, expansus 5–6 lin. diam., pedicellis perspicuis erecto-patentibus perianthio sæpe æquilongis, basi bractea deltoidea, apice calyculo trilobato præditis. Perianthium campanulatum albido-viridulum $1\frac{1}{2}$ lin. longum, segmentis oblanceolato-oblongis obtusis dorso trinervatis. Filamenta linearia segmentis æquilonga, antheris minutis globosis versatilibus cite deciduis. Ovarium ampullæforme, carpellis in stylos brevissimos falcatos sensim angustatis. Carpella fructifera perianthio accreto æquilonga, seminibus in loculo 6–8. *America borealis orientalis in pinetis Carolinæ et Arkansas.*

11. T. FALCATA, *Willd. in Berl. Mag.* ii. 29; *Kunth, Enum.* iv. 172.—T. frigida, *H. B. K. Nov. Gen.* i. 267; *Kunth, loc. cit.*—T. flexuosa, *Willd. loc. cit.*—T. sessiliflora, *Hook. Ic. Plant.* t. 691.—Isidrogalvia falcata, *Ruiz et Pav. Fl. Peruv.* iii. 69, t. 302.—I. Moritziana, *Klotzsch MSS.*—Narthecium falcatum, *Poir. Encyc. Suppl.* iv. 61. Folia radicalia linearia rigida 3–12 poll. longa 3–4 lin. lata conspicue crebre 10–15-nervata, margine scabra. Caulis gracilis glaber pedalis vel sesquipedalis, foliis 3–4 bracteiformibus parvis solum præditus. Racemus floriferus densus vel laxus 1–2-pollicaris, expansus 7–9 lin. diam., pedicellis ascendentibus subnullis (*T. sessiliflora,* Hook.) vel interdum perianthio æquilongis, basi bractea deltoidea vel lanceolata, apice calyculo magno bracteis tribus deltoideis basi solum concretis instructis. Perianthium oblongum albidum 4–5 lin. longum, segmentis oblongo-lanceolatis dorso laxe 5–7-nervatis. Stamina perianthio distincte breviora, filamentis filiformibus, antheris lineari-oblongis basifixis. Ovarium ampullæforme, stylis floriferis concretis,

stigmate capitato. Capsula ovoideo-globosa 3–4 lin. longa, stylis tribus ⅓ lin. longis rectis persistentibus, seminibus in loculo 6–8. *Andes a Columbia ad Peruviam, alt.* 11000 *pedum ascendens.*

44. Triantha, *Nutt.*

Nutt. Gen. i. 236 (ut sectio *Tofieldiæ*).

Flores hermaphroditi. *Perianthium* firmulum campanulatum persistens 6-partitum, segmentis subæqualibus lanceolatis obtusis flore expanso patulis. *Stamina* 6 subhypogyna exserta, filamentis filiformibus, antheris minutis subglobosis basifixis basi emarginatis margine dehiscentibus. *Ovarium* sessile triloculare, ovulis in loculo permultis superpositis; *styli* 3 liberi apice stigmatosi. *Capsula* membranacea subglobosa septicida trivalvis, seminibus minutissimis oblongis apice et basi cauda subulata alba membranacea præditis, testa brunnea membranacea, albumine carnoso, embryone minuto. *Habitus omnino* Tofieldiæ; *recedit racemis sæpe centrifugalibus, pedicellis ternis, caule pedicellisque scabris, antheris margine dehiscentibus et seminibus, more* Narthecii, *utrinque caudatis.*

Americanæ.
Caulis glanduloso-scaber. Racemus brevis ... 1. *T. glutinosa.*
Caulis hispido-scaber haud glandulosus. Racemus elongatus. 2. *T. pubens.*
Japonica.. 3. *T. japonica.*

1. T. glutinosa, *Baker.*—Tofieldia glutinosa, *Pers. Syn.* i. 399; *Willd. in Bot. Mag.* ii. 29; *Smith in Trans. Linn. Soc.* xii. 246, tab. 8. fig. 2; *Kunth, Enum.* iv. 171; *A. Gray, Fl. N. States,* edit. v. 527.—Narthecium glutinosum, *Michx. Fl.* i. 210. Folia radicalia linearia glabra 4–8 poll. longa 1½–2 lin. lata 6–10-nervata. Caulis gracilis flexuosus 6–18-pollicaris, superne glandulis nigris et pilis paucis brevissimis hispidis scabra, infra medium foliis 2–3 reductis erectis præditus. Racemus floriferus brevis densus vel sublaxus ½–1½ pollicaris, pedicellis brevissimis vel brevibus scabris erecto-patentibus ternis basi bractea deltoidea apice calyculo præditis. Racemus fructiferus laxior, pedicellis inferioribus 3–4 lin. longis. Perianthium 2 lin. longum, segmentis oblanceolatis obtusis trinervatis flore expanso reflexis. Stamina breviter exserta, filamentis linearibus, antheris subglobosis violaceis. Capsula globosa 2½–3 lin. longa, stylis persistentibus ½ lin. longis. *America borealis a Sitka et insula Vancouver ad Terram Novam et Carolinam.*

2. T. pubens, *Baker.*—Tofieldia pubens, *Dryand. in Ait. Hort. Kew.*

2nd edit. ii. 326; *Smith in Trans. Linn. Soc.* xii. 245; *Willd. in Berl. Mag.* ii. 28; *Bot. Mag.* t. 3859.—T. pubescens, *Pers. Syn.* i. 399; *DC. in Red. Lil.* t. 324.—Narthecium pubens, *Michx. Fl. Am.* i. 209. Folia radicaliaanguste linearia rigidula glabra semipedalia vel pedalia 1½–2 lin. lata 10–12-nervia, marginibus incrassatis. Caulis gracilis 1–2-pedalis pilis hispidis albidis brevissimis scaber, foliis 1–2 reductis erectis infra medium instructus. Racemus floriferus laxus 2–4-pollicaris, expansus 6–9 lin. diam., pedicellis ternis erecto-patentibus scabris 2–3 lin. longis basi bractea minuta deltoidea, apice calyculo minuto præditis. Perianthium albidum 2 lin. longum, segmentis oblanceolatis trinervatis flore expanso reflexis. Stamina breviter exserta, filamentis filiformibus, antheris subglobosis violaceis. Capsula obovoidea perianthio accreto æquilonga, stylis falcatis ½ lin. longis. *America borealis orientalis in pinetis a Nova Cæsarea ad Floridam.*

3. T. japonica, *Baker.*—Tofieldia japonica, *Miquel in Ann. Mus. Lug. Bat.* iii. 201; *Franch. et Savat. Enum. Jap.* ii. 89; *So Mokou Zoussetz,* vol. vii. t. 30. Folia radicalia rigidula linearia 6–9 poll. longa acie utraque dense ciliolato-scabrida. Caulis pedalis unifolius, superne cum pedicellis pilis brevibus rigidis glanduliferis scabra. Racemus laxus interdum digitalis, pedicellis ternis erecto-patentibus inferioribus 3–4 lin. longis, basi bractea minuta deltoidea, apice calyculo minuto præditis. Perianthium 2 lin. longum, segmentis oblanceolatis trinervatis. Stamina segmentis æquilonga. Ovarium obovoideo-oblongum glabrum, carpellis in stylos falcatos attenuatis. *Japonica in paludosis,* Kieske, Savatier 1234. *Non vidi.*

45. Pleea, *Rich.*

Rich. in Michx. Fl. Bor.-Amer. i. 246, t. 25; *A. Gray in Ann. Lyc. New York,* iv. 139; *Endl. Gen.* No. 1063; *Kunth, Enum.* iv. 173.

Flores hermaphroditi. *Perianthium* firmum 6-partitum, segmentis 6 æqualibus linearibus acutis flore expanso patulis. *Stamina* 9–12 hypogyna, filamentis leviter applanatis quam segmenta brevioribus, antheris basifixis bilocularibus lanceolatis basi sagittatis introrsum longitudinaliter dehiscentibus. *Ovarium* liberum oblongum triloculare, ovulis in loculo crebris superpositis, stylis liberis brevibus apice stigmatosis. *Capsula* rigide coriacea septicida trivalvis, seminibus minutis turgidis angustis apice caudatis, testacea chartacea brunnea, albumine firmo, embryone minuto, raphe valida.

1. P. tenuifolia, *Michx. & A. Gray, loc. cit.* Herba glaberrima dura, rhizomate reptante radicibus fibrosis, foliis distichis equitantibus linearibus semipedalibus acuminatis basi dilatatis rigide coriaceis facie planis

venis crebris exsculptis. Caulis strictus durus gracilis 1½–2-pedalis, foliis 2–3 reductis erectis præditus. Racemus laxus secundus 6–8-florus, bracteis duris acuminatis lanceolato-navicularibus 9–18 lin. longis imbricatis rachin amplectentibus, pedicellis exsertis erectis supra medium bracteolis 1–2 lanceolatis parvis brunneis scariosis præditis. Perianthium 6–7 lin. longum albidum extus viridulum. Carpella fructifera segmentis breviora *America borealis in udis apertis Carolinæ.*

46. Petrosavia, *Beccari.*

Beccari in Nuov. Giorn. Bot. Ital. iii. 7, t. 1.

Perianthium coloratum trigonum persistens 6-partitum, segmentis 3 exterioribus ovatis, 3 interioribus lanceolatis. *Stamina* 6 profunde perigyna, filamentis subulatis quam segmenta brevioribus, antheris oblongis bilocularibus basifixis introrsum longitudinaliter dehiscentibus. *Carpella* 3 libera ad apicem stigmatosum angustata, ovulis in loculo crebris superpositis. *Fructus* follicularis, carpellis stellatim patentibus sutura ventrali dehiscentibus, seminibus ovoideo-ellipticis 7–9-costatis, testa brunnea chartacea.

1. P. stellaris, *Beccari, loc. cit.* Herba parasitica erecta gracilis glabra 5–6-pollicaris, foliis omnibus caulinis rudimentariis scariosis bracteiformibus, inferioribus crebris deltoideis, superioribus segregatis lanceolatis. Flores 10–12 in corymbum dispositi, pedicellis erecto-patentibus strictis 6–8 lin. longis basi bracteatis. Perianthium luteum, segmentis 1½ lin. longis, flore expanso reflexis persistentibus. Carpella fructifera segmentis longiora. *Borneo ad montem Poe, prope Sarawak,* alt. 3000 *pedum,* Beccari 2399.

47. Scoliopus, *Torrey.*

Torrey, Bot. Whipple, 89, t. 22.

Flores hermaphroditi. *Perianthium* corollinum 6-partitum, segmentis exterioribus lanceolatis, interioribus linearibus. *Stamina* 6 hypogyna segmentis triplo breviora, filamentis subulatis, antheris oblongis bilocularibus versatilibus extrorsum longitudinaliter dehiscentibus. *Ovarium* sessile ampullæforme uniloculare, placentis tribus parietalibus, ovulis crebris superpositis; stylis tribus brevibus falcatis introrsum longitudinaliter stigmatosis. *Capsula* oblonga subalato-triquetra, seminibus (immaturis solum visis) compressis raphi valida percursis.

1. S. Bigelovii, *Torrey, loc. cit.*; *Regel, Gartenfl.* 1875, 227, t. 348.

Herba glabra, rhizomate obliquo cylindrico fibris multis duris gracilibus prædito, collo hypogæo 1–2 poll. longo. Folia 2 ad terram producta oblonga patula 6–8 poll. longa, medio 2–4 poll. lata, acuta vel subobtusa venis primariis 5–7 percursa. Flores 6–12 ex centro foliorum orti umbellati, pedicellis flexuosis 3–8 poll. longis. Perianthium sordide purpureum 6–7 lin. longum, segmentis exterioribus 2 lin. latis multinervatis, interioribus ½ lin. latis. Pistillum segmentis paulo brevius. *California*, Bigelow! Samuels! et forma MINOR ab *Oregon*, Hall 518! foliis 3 poll. longis 12–15 lin. latis, floribus 2–3 productis.

Tribus CONANTHEREÆ.

48. CONANTHERA, *Ruiz et Pavon.*

Ruiz et Pavon, Fl. Peruv. iii. 68, t. 31; *Endl. Gen.* No. 1157; *Kunth, Enum.* iv. 630; *Miers in Trans. Soc. Linn.* xxiv. tab. 53. figs. 14–22.

Perianthium corollinum cæruleum basi ovario adnatum, segmentis 6 ad ovarium liberis conformibus lanceolatis laxe 3–5-nervatis, flore expanso reflexis. *Stamina* 6 ad basin segmentorum inserta, filamentis brevissimis applanatis, antheris magnis linearibus valvatis in conum diu approximatis basifixis apice acuminatis poris dehiscentibus. *Ovarium* ⅓ inferum sessile globosum triloculare, ovulis in loculo pluribus superpositis; stylus rectus filiformis, apice capitato stigmatoso. *Capsula* globosa chartacea trilobata loculicida trivalvis. *Semina* non vidi. *Habitus omnino* Cumingiæ; *recedit segmentis ad ovarium liberis, antheris magnis diu valvatis.*

1. C. BIFOLIA, *Ruiz et Pavon, loc. cit.*; *C. Gay, Fl. Chil.* vi. 130. Herba glabra erecta fragilis semipedalis ad sesquipedalis. Bulbus ovoideus 6–9 lin. diam. edulis, tunicis pluribus reticulato-fibrosis. Folia radicalia 2–3 linearia graminoidea. Caulis semipedalis vel pedalis foliis paucis reductis linearibus convolutis præditus. Racemi laxiflori pauciflori simplices vel pauci, pedicellis 3–9 lin. longis bracteatis et bracteolatis inarticulatis, floriferis cernuis, fructiferis erectis. Perianthium membranaceum saturate cæruleum 8–12 lin. longum. Antheræ luteæ 4–6 lin. longæ. *Chili in campis*, Cuming 382! Bertero 195! 928! Bridges 1272!

49. CUMINGIA, *D. Don.*

D. Don in Loudon Mag. Nat. Hist. 1828, 362, fig. 169 *a*; *Kunth, Enum.* iv. 631; *Miers in Trans. Linn. Soc.* xxiv. 507, tab. 53. figs. 23–29.—Conantheræ sp., *Sims etc.*

Perianthium corollinum cæruleum hypocrateriforme basi ovario adnatum, tubo supra ovarium producto oblongo, segmentis oblongis obtusis subconformibus flore expanso patulis. *Stamina* 6 omnia perfecta in tubo inclusa ad tubi basin uniseriatim inserta, filamentis brevissimis, antheris erectis linearibus basifixis acuminatis poris apicalibus dehiscentibus. *Ovarium* globosum sessile semiinferum triloculare, ovulis in loculo pluribus; stylus filiformis, stigmate minuto capitato. *Capsula* globosa chartacea loculicida trivalvis, seminibus parvis triquetris, testa atro-fusca opaca membranacea, albumine firmo, embryone axili. *Herbæ bulbosæ chilenses, bulbi tunicis pluribus reticulato-fibrosis, foliis basalibus paucis linearibus, caulinis reductis basi interdum bulbilliferis, floribus copiosis cæruleis thyrsoideo-paniculatis, pedicellis inarticulatis, bracteatis.*

Grandiflora, capsulis erectis .... 1. *C. campanulata.*
Parviflora, capsulis cernuis..................... 2. *C. parvula.*

1. C. CAMPANULATA, *D. Don, loc. cit.*; *Sweet, Brit. Flow. Gard.* t. 257; *Kunth, Enum.* iv. 632; *C. Gay, Fl. Chil.* vi. 131; *Philip. Fl. Atacam.* 52.—Conanthera campanulata, *Lindl. in Trans. Hort. Soc.* vi. 283; *Hook. Exot. Flora*, t. 214; *Lindl. in Bot. Reg.* t. 1193.—C. bifolia, *Sims in Bot. Mag.* t. 2496, *non Ruiz et Pavon.* Herba glabra erecta fragilis valde ramosa 1–2-pedalis. Bulbus ovoideus 1 poll. diam., tunicis pluribus fibroso-reticulatis apice setiferis. Folia basalia 2–3 linearia graminoidea; caulina pauca reducta basi sæpe bulbillifera. Panicula laxa thyrsoidea semipedalis vel pedalis, ramis ascendentibus paucifloris subcorymbosis, bracteis minutis lanceolatis, pedicellis 3–6 lin. longis, floriferis erectis vel apice cernuis, fructiferis strictis erectis. Perianthium cæruleum immaculatum 6–9 lin. longum, segmentis oblongis 5-nervatis tubo æquilongis. Antheræ 2 lin. longæ. Capsula magnitudine pisi profunde lobata. *Chili in aridis.*—C. TRIMACULATA, *D. Don in Sweet Brit. Flow. Gard.* ser. ii. t. 88, est forma robusta grandiflora perianthii segmentis tribus interioribus basi maculis atroviolaceis notatis.—C. TENELLA, *D. Don, Kunth, Enum.* iv. 633, est forma gracilis semipedalis floribus paucis pallide cæruleis immaculatis 5–6 lin. longis.

2. C. PARVULA, *Philippi in Linnæa*, xxix. 74. Bulbus globosus 6–8 lin. diam., tunicis multis fibroso-reticulatis. Caulis infra paniculam 1–2-pollicaris, foliis linearibus. Panicula deltoidea 1–1½ poll. longa et lata, pedicellis inferioribus 2–3 lin. longis, floriferis et fructiferis cernuis. Perianthium 3–3½ lin. longum pallide cæruleum immaculatum, segmentis tubo æquilongis. Capsula 1½ lin. longa. *Chili in aridis prope urbem Valparaiso*, Germain!

50. Zephyra, *D. Don.*

D. Don in Edin. New Phil. Journ. 1832, 236; *Kunth, Enum.* iv. 633; *Miers in Trans. Linn. Soc.* xxiv. 503, tab. 53. figs. 1–4. -Dicolus, *Philippi, Descr. Pl. Nuev.* 1873, 74.

Perianthium corollinum cæruleum hypocrateriforme, basi ovario adnatum, tubo producto cylindrico sursum constricto, segmentis subconformibus tubo longioribus oblongis vel obovatis obtusis multinervatis flore expanso patulis. *Stamina* perfecta 4 cum staminodiis 2 calcariformibus 2 alternantia ad faucem tubo inserta uniseriata segmentis multo breviora, filamentis brevissimis subulatis, antheris oblongis basifixis erectis oblique calcaratis, apice poris dehiscentibus. *Ovarium* triloculare, ovulis in loculo crebris; stylis rectis filiformibus, apice capitato stigmatoso. *Capsula* membranacea obovoideo-triquetra loculicida trivalvis, seminibus paucis parvis oblongis turgidis, testa rugosa membranacea atrocastanea opaca, albumine firmo, embryone axili cylindrico.

1. Z. elegans, *D. Don et Kunth, locc. citt.*—Z. amœna, *Miers, loc. cit.* —Dicolus cærulescens, *Philippi, loc. cit.* Herba bulbosa glabra erecta ramosa semipedalis vel pedalis. Folia radicalia 3–4 linearia acuminata semipedalia et ultra 3–4 lin. lata; caulina pauca reducta. Panicula deltoidea multiflora interdum semipedalis, ramis erecto-patentibus, inferioribus foliis elongatis bracteatis, racemis subcorymbosis, bracteis ultimis minutis subulatis, pedicellis inarticulatis, inferioribus 9–15 lin. longis, floriferis erectis vel cernuis, fructiferis strictis erectis apice incrassatis. Perianthium 9–10 lin. longum pallide vel saturate cæruleum, tubo 2 lin. longo, segmentis 2–3 lin. latis 7–9-nervatis. Stamina 1 lin. longa. Capsula 4 lin. longa obtusa styli basi persistente mucronata. *Peruvia in Monte Lomas prov. Iquique, alt.* 3000 *pedum,* Bollaert! *Chili prope urbem Concepcion,* Bridges 1312! Cuming 872! *Atacama ad Carrizal bago,* King!

51. Tecophilæa, *Bertero.*

Colla in Mem. Taur. xxxix. 19, t. 55; *Herbert, Amaryll.* 69, 125, tab. 24. figs. 16–17; *Miers in Trans. Soc. Linn.* xxiv. 504, tab. 53. figs. 5–13.—Distrepta, *Miers, Trav. Chil.* ii. 529.—Phryganthus, *Pöpp. et Endl. Nov. Gen.* ii. 71, t. 200.—Pœppigia, *Kunze in Reich. Consp.* 222 *a.*

Perianthium corollinum hypocrateriforme leviter obliquum basi ovario adnatum, tubi brevi apice constricto, segmentis 6 subconformibus oblongis vel obovatis flore expanso patulis. *Stamina* prope faucem tubi inserta uniseriata, 3 anteriora fertilia filamentis brevissimis, antheris oblongis basifixis erectis, basi calcaratis,

apice poris dehiscentibus; 3 posteriora sterilia linearia. *Ovarium* sessile triloculare $\frac{2}{3}$-inferum, ovulis in loculo pluribus; stylus rectus filiformis, apice stigmatoso tricuspidatus. *Capsula* membranacea apice loculicida trivalvis, seminibus parvis turgidis, testa nigra membranacea, albumine firmo, embryone axili. *Herbæ bulbosæ, tunicis fibrosis, foliis radicalibus linearibus vel lanceolatis* 1–3, *pedunculis simplicibus vel ramosis, floribus cæruleis.*

Folium radicale unicum. Pedunculi elongati sæpe ramosi.. 1. *T. violæflora.*
Folia radicalia 2–3. Pedunculi breves simplices .... 2. *T. cyaneo-crocea.*

1. T. VIOLÆFLORA, *Bertero, loc. cit.*; *C. Gay, Fl. Chil.* vi. 36.—Distrepta vaginata, *Miers, loc. cit.*—Phyganthus vernus, *Pöpp. et Endl. loc. cit.*—Poppigia chilensis, *Kunze, loc. cit.* Bulbus globosus 5–6 lin. diam., tunicis fibrosis apice setosis, collo hypogæo 1–2-pollicari. Folium radicale solitarium erectum lanceolatum firmulum 6–9 poll. longum medio 6–9 lin. latum acutum ad basin caulem amplectentem angustatum, venis primariis perspicuis circiter 7, intermediis crebris tenuioribus. Caulis gracillimus erectus 3–6-pollicaris 1–4-florus, bracteis minutis, pedicellis brevibus ascendentibus. Perianthium 6–8 lin. longum saturate cæruleum, tubo 1 lin. longo, segmentis oblongo-lanceolatis $1\frac{1}{2}$–2 lin. latis 7–9-nervatis. Stamina 1 lin. longa. Capsula 6–8 lin. longa, valvis 2 lin. longis. *Chili prope urbem Valparaiso, etc.*, Bridges 429! Cuming 593! *Peruvia in collibus prope Limam,* Nation!—T. ALBIDA, *Miers in Trans. Soc. Linn.* xxiv. 505; est varietas humilis floribus minoribus albidis.

2. T. CYANEO-CROCEA, *Leybold in Seem. Journ.* i. 10; *Miers in Trans. Linn. Soc.* xxiv. 505; *Gard. Chron.* 1872, 219. Bulbus globosus 8–9 lin. diam., tunicis fibrosis, collo hypogæo 1–2-pollicari folio membranaceo haud producto cincto. Folia radicalia producta 2–3 linearia acuminata canaliculata undulata 3–6 poll. longa 3–6 lin. lata. Pedunculi 1–3 erecti simplices uniflori ebracteati 1–2 poll. longi. Perianthium 15–18 lin. longum pulchre cæruleum fauce albidum, tubo 2 lin. longo sursum constricto, segmentis obovatis multinervatis 6–8 lin. latis. Stamina 1 lin. longa, antheris oblongis luteis staminodiis paulo brevioribus. *Chili in montibus,* Leybold! Hort. Leichtlin!

Var. REGELII, *Baker.*—T. cyaneo-crocea, *Regel, Gartenflora,* tab. 718, ab typo recedit foliis longioribus angustioribus haud undulatis, pedunculis longioribus, perianthii segmentis angustioribus magis oblongis (1 poll. longis, 4–5 lin. latis).

52. CYANELLA, *Linn.*

Linn. Gen. 240; *Endl. Gen.* No. 1144; *Kunth, Enum.* iv. 635; *Miers in Trans. Linn. Soc.* xxiv. 508.—Cyanella, Trigella, *et* Pharetrella, *Salisb. Gen.* 46–47.

Perianthium ringens corollinum basi ovario adnatum, segmentis ad ovarium liberis laxe multinervatis oblongis obovatis vel lanceolatis, superioribus flore expanso recurvatis, inferioribus ascendentibus. *Stamina* 6 plus minus inæqualia ad basin segmentorum inserta, filamentis brevibus filiformibus, antheris lineari-oblongis basifixis poris apicalibus dehiscentibus. *Ovarium* triloculare, ovulis in loculo pluribus; stylus filiformis declinatus apice stigmatoso obscure tricuspidatus. *Capsula* chartacea tarde loculicida trivalvis, seminibus oblongis turgidis, testa nigra crustacea nitidula, albumine firmo, embryone cylindrico. ***Herbæ bulbosæ capenses, bulbis tunicatis superpositis, foliis plerisque radicalibus rosulatis, caulinis paucis reductis, floribus versicoloribus laxe racemosis raro solitariis, pedicellis inarticulatis bracteatis et bracteolatis.***

Pedunculi uniflori. Folia teretia .... 1. *C. alba.*
Flores racemosi. Folia plana.
  Stamina 3 declinata, antheris majoribus... 2. *C. orchidiformis.*
  Stamen 1 declinatum, anthera majore.
    Perianthium 3–4 lin. longum .... 3. *C. capensis.*
    Perianthium 6–9 lin. longum .... 4. *C. lutea.*

1. C. ALBA, *Linn. fil. Suppl.* 201; *Thunb. in Act. Holm.* 1794, t. 7. fig. 2; *Flor. Cap.* 329; *Kunth, Enum.* iv. 640.—Pharetrella alba, *Salisb. Gen.* 47. Bulbus globosus, collo hypogæo 3–4-pollicari. Folia basalia 12–20 erecta subulata rigidula glabra 3–4 poll. longa, extimum basi dilatata cupuliformi membranacea reliqua amplectente. Pedunculi 3–6 simplices uniflori semipedales vel pedales nudi vel deorsum folio unico reducto parvo instructi. Perianthium albidum horizontale 6–9 lin. longum, segmentis interioribus oblongis acutis 3–4 lin. latis laxe distincte 5–7-nervatis, exterioribus oblongo-lanceolatis dorso rubro tinctis apice cuspide viridi terminatis. Stamina subæqualia perianthio triente breviora, 5 arcuata, 1 declinatum, antheris luteis 3 lin. longis. *C. B. Spei,* Masson! Mader 135! etc.

2. C. ORCHIDIFORMIS, *Jacq. Coll.* iv. 211, *Ic.* t. 447; *Kunth, Enum.* iv. 637.—Trigella orchidiformis, *Salisb. Gen.* 46. Bulbus globosus magnitudine nucis avellanæ, collo hypogæo brevi. Folia radicalia 3–4 oblonga vel lanceolata 3–6 poll. longa 9–18 lin. lata acuta vel acuminata modice firma distincte multinervata marginibus minute ciliatis. Scapus semipedalis simplex vel parce ramosus foliis 1–2 valde reductis linearibus instructus. Racemus terminalis laxus 3–4-pollicaris, expansus 1½–2 poll. diam., pedicellis arcuatis inferioribus 6–9 lin. longis, basi bracteatis, medio bracteolatis. Perianthium 6 lin. longum rubellum vel violaceum, segmentis exterioribus majoribus obovatis unguiculatis 3–4 lin. latis laxe 7–9-

nervatis, interioribus brevioribus et angustioribus. Stamina perianthio duplo breviora: 3 declinata, filamentis brevissimis, antheris 2 lin. longis; 3 arcuata, filamentis longioribus, antheris minoribus. *C. B. Spei*, Drège 8602, Pappe! etc.

3. C. CAPENSIS, *Linn. Sp. Plant.* 443; *Thunb. Fl. Cap.* 330; *Bot. Mag.* t. 568; *Andr. Bot. Rep.* t. 541; *Jacq. Hort. Vind.* iii. t. 35; *Red. Lil.* t. 373; *Kunth, Enum.* iv. 636.—C. cærulea, *Ecklon, Verz. Top.* 4. Herba erecta semipedalis ad sesquipedalis, bulbo globoso, tunicis crasse fibrosis, collo hypogæo interdum semipedali. Folia basalia 4–6 linearia vel lineari-lanceolata 4–8 poll. longa 6–9 lin. lata rigidula valde undulata distincte multinervata, marginibus minute ciliatis. Caules valde ramosi, foliis paucis reductis instructi. Racemi laxissimi, terminales 4–6 poll. longi, expansi 1½–2 poll. diam., pedicellis ascendentibus bracteatis et bracteolatis, inferioribus 6–12 lin. longis. Perianthium violaceum 3–4 lin. longum, segmentis exterioribus oblongis 5–7-nervatis, interioribus æquilongis oblanceolatis trinervatis. Stamina omnia filamentis brevissimis: 5 arcuata, antheris 1 lin. longis; unicum declinatum, anthera 1½ lin. longa. Capsula magnitudine pisi parvi. *C. B. Spei*, Drège 8600! Zeyher 1718! Burchell 129! 153! 6532! 6584!

4. C. LUTEA, *Linn. fil. Suppl.* 201; *Thunb. Act. Holm.* 1794, 195, tab. 7. fig. 1; *Fl. Cap.* 330; *Bot. Mag.* t. 1252; *Kunth, Enum.* iv. 639. Herba erecta semipedalis vel pedalis, bulbo globoso magnitudine nucis avellanæ, tunicis reticulato-fibrosis, collo hypogæo 1–6-pollicari. Folia radicalia 4–8 linearia 4–6 poll. longa 3–6 raro 9 lin. lata tenuiora quam in *C. capensi*, margine glabra vel minute ciliata. Caules sæpissime ramosi, foliis paucis valde reductis instructi. Racemi laxissimi, terminalis sæpe semipedalis, expansus 2–3 poll. diam., pedicellis ascendentibus bracteatis et bracteolatis, inferioribus 12–18 lin. longis. Perianthium 6–9 lin. longum pallidum vel rubellum, segmentis exterioribus lanceolatis 5-nervatis, interioribus oblongis trinervatis. Stamina omnia filamentis brevissimis: 5 arcuata, antheris 1–2 lin. longis; 1 declinatum, anthera 2–4 lin. longa. Capsula magnitudine pisi magni (4 lin. diam.). *C. B. Spei*, Drège 8604! Zeyher 255! 4256! Burchell 1630! 2346! 2256! 4148! 6100! 6174! Cooper 270!—C. ROSEA, *Eckl. MSS.*—C. lutea, var. rosea, *Baker in Saund. Rep. Bot.* t. 259, est forma floribus rubellis.—C. LINEATA, *Burchell, Travels*, ii. 589, est forma nana 3–4-pollicaris floribus confertis roseis subcorymbosis.—C. ODORATISSIMA, *Lindl. in Bot. Reg.* t. 1111; *Kunth, Enum.* iv. 637, est forma floribus magnis rubris odoratis.

53. WALLERIA, *Kirk.*

Kirk in Trans. Linn. Soc. xxiv. 497, t. 52.

Perianthium regulare corollinum basi ovario adnatum, seg-

mentis ad ovarium liberis multinervatis subconformibus lanceolatis acutis. *Stamina* 6 ad basin segmentorum inserta, filamentis filiformibus brevissimis, antheris magnis linearibus diu in conum approximatis basifixis poris apicalibus dehiscentibus. *Ovarium* ovoideum triloculare, ovulis in loculo pluribus superpositis; stylus rectus filiformis, stigmate minuto capitato. *Capsula* chartacea loculicida trivalvis. *Semina* non vidi.

1. W. MACKENZII, *Kirk in Trans. Linn. Soc.* xxiv. 597, t. 52. fig. 2.—W. angolensis, *Baker in Trans. Linn. oc.* new ser. *Bot.* i. 262. Herba erecta glabra pedalis vel sesquipedalis, tubere carnoso difformi. Folia 20–30 omnia caulina sessilia oblonga vel lanceolata acuta 2–4 poll. longa infra medium 3–9 lin. lata, inferiora parva reducta. Pedicelli ex axillis foliorum multorum producti simplices vel raro furcati bracteolati ascendentes 12–18 lin. longi. Perianthium cæruleum 6–9 lin. longum, segmentis 2 lin. latis 5–7-nervatis. Stamina perianthio paulo breviora, antheris 4 lin. longis. *Africa australis tropicalis; montes Manganya,* Waller! *Angola in ditione Huilla,* Welwitsch! *Lacus Tanganika,* Capt. Cameron!

Var. W. NUTANS, *Kirk in Trans. Linn. Soc.* xxiv. 597, t. 52. fig. 1, est forma gracilis foliis linearibus 3–4 poll. longis, floribus cernuis. *Montes Manganya,* Waller!

Tribus LIRIOPEÆ.

54. LIRIOPE, *Lour.*

Lour. Fl. Cochin. i. 290 (1790).—Ophiopogon, *Ker in Bot. Mag.* t. 1063 (1808), *ex parte*; *Kunth, Enum.* v. 297.—Ophiopogon *et* Liriope, *Maxim. in Bull. Acad. Péters.* vii. 320.—Dracænæ sp., *Linn.*—Convallariæ sp., *Thunb.*

Perianthium corollinum 6-partitum ovario haud adnatum, segmentis subconformibus oblongis 1-nervatis diu ascendentibus. *Stamina* 6 inclusa subhypogyna, filamentis filiformibus antheris æquilongis, antheris oblongis utrinque emarginatis dorso supra basin affixis. *Corona* nulla. *Ovarium* liberum sessile depressoglobosum triloculare, ovulis in loculo erectis collateralibus; stylus subulatus, stigmate punctiformi. *Semina* sæpissime solitaria ex pericarpio rumpente protrusa globosa, testa atro-cærulea membranacea, albumine corneo, embryone cylindrico.

1. L. GRAMINIFOLIA, *Baker.*—Dracæna graminifolia, *Linn. Syst.* 275; *Lam. Ency.* ii. 324; *Thunb. et Dalm. Diss.* 3!—Liriope spicata, *Lour. Cochin.* i. 200.—Convallaria spicata, *Thunb. Jap.* 141.—Ophiopogon spicatus, *Ker in Bot. Mag. sub* t. 1063; *Bot. Reg.* t. 593; *Lodd. Bot. Cab.*

t. 694.—O. longifolius, *Decne in Van Houtte, Fl. des Serres,* xvii. 182.—O. gracilis, *Kunth, Enum.* v. 298.—Fluggea spicata, *Schult. fil. Syst.* vii. 310.—Ophiopogon japonicus, *Wall. Cat.* 5139, *ex parte, non Ker.* Herba glabra cæspitosa erecta semipedalis vel pedalis rhizomatosa stolonifera, fibris radicalibus elongatis gracilibus. Folia radicalia plura erecta linearia graminoidea 1–2-pedalia, 2–3 lin. lata. Scapus nudus sursum angulatus semipedalis vel pedalis. Racemi simplices sublaxi 2–6 poll. longi, expansi 8–9 lin. diam., pedicellis aggregatis erecto-patentibus sub apice articulatis 1½–2 lin. longis, bracteis minutis membranaceis persistentibus deltoideis vel lanceolatis. Perianthium violaceum vel albidum 1½–2 lin. longum. Stamina perianthio paulo breviora. Semina globosa magnitudine pisi. *China et Cochin China.*

Var. DENSIFLORA, *Maxim. loc. cit.*—Ophiopogon spicatus, *Hook. in Bot. Mag.* t. 5348; *Kunth, Enum.* v. 299, *excl. syn.*—O. Muscari, *Decne in Van Houtte, Fl. des Serres,* xvii. 181. Robustior, foliis latioribus (4–8 lin. latis), racemis desioribus interdum deorsum compositis, pedicellis apice articulatis, floribus majoribus. *Japonia, Formosa, China borealis et insulæ Loo Choo.*

Var. MINOR, *Maxim. loc. cit.*, est forma nana japonica foliis angustis, floribus paucis magnis.

55. FLUGGEA, *Rich.*

Rich. in Schrad. Journ. ii. pt. i. 9, tab. 1. fig. A; *Kunth, Enum.* v. 301.—Ophiopogon, *Ker in Bot. Mag.* t. 1063, *ex parte.*—Ophiopogon *et* Fluggea, *Maxim. in Bull. Acad. Péters.* vii. 320.—Slateria, *Desv. in Journ. Bot.* i. 244.—Chloopsis, *Blume, Enum.* i. 14.—Convallariæ sp., *Thunb.*

Perianthium corollinum albidum vel lilacino tinctum, tubo obconico ovario adnato, segmentis 6 subconformibus oblongis vel lineari-oblongis flore expanso patulis dorso uninervatis. *Stamina* 6 ad basin segmentorum inserta inclusa, filamentis latis brevissimis, antheris lanceolatis subbasifixis erectis introrsum longitudinaliter dehiscentibus. *Ovarium* globosum semiinferum triloculare, ovulis in loculo 2–4; stylus erectus subulatus, stigmate obscure tricuspidato. *Semina* ad ovarium sæpe solitaria ex pericarpio haud accrescente rumpente protrusa globosa vel oblonga, testa atro-cærulea membranacea, albumine firmo, embryone cylindrico. *Herbæ vel raro suffrutices scandentes, foliis sæpissime sessilibus linearibus, pedunculis nudis, floribus multis simpliciter racemosis, pedicellis articulatis sæpe aggregatis, bracteis membranaceis albidis persistentibus.*

Folia sessilia.
 Pedicelli inferiores 2–3ni .... 1. *F. japonica.*
 Pedicelli inferiores 6–9ni .... 2. *F. Jaburan.*
Folia distincte petiolata.
 Herbacea, foliis 6–9 latis .... 3. *F. Griffithii.*
 Suffruticosa, foliis ½–2 poll. latis .... 4. *F. dracænoides.*

1. F. JAPONICA, *Richard et Kunth. loc. cit.*—Convallaria japonica, *Linn. fil. Suppl.* 204; *Red. Lil.* t. 80.—C. japonica, var. minor, *Thunb. Jap.* 140.—Ophiopogon japonicus, *Ker in Bot. Mag.* t. 1063.—Slateria japonica, *Desv. in Journ. Bot.* i. 244. Herba acaulis perennis glabra rhizomatosa stolonifera, fibris radicalibus elongatis gracilibus sæpe nodulosis. Folia radicalia plura erecta anguste linearia semipedalia vel pedalia deorsum angustata medio 1–1½ lin. lata 5–7-nervata. Scapus 2–4-pollicaris nudus angulatus. Racemus laxus pauciflorus subsecundus 2–3-pollicaris, pedicellis floriferis cernuis 1–2 lin. longis medio articulatis, inferioribus 2–3nis, bracteis lanceolatis albidis 2–3 lin. longis. Perianthium albidum 2 lin. longum, segmentis lineari-oblongis. Semen ad ovarium sæpissime unicum globosum, exsiccatum 3 lin. diam. *Japonia, Insulæ Koreanæ et China borealis.*

Var. UMBRATICOLA.—Ophiopogon (Fluggea) umbraticola, *Hance in Seem. Journ.* 1868, 115. Folia pedalia et ultra 1½ lin. lata. Scapus semipedalis. Racemus laxus semipedalis, pedicellis ascendentibus, floriferis 3–4 lin. longis, bracteis linearibus, floribus parvis. *China australis in ditione Canton,* Sampson et Hance!

Var. F. INTERMEDIA, *Schultes fil. Syst.* vii. 310; *Kunth, Enum.* v. 306.—Ophiopogon intermedius, *D. Don, Prodr. Nep.* 48; *Royle, Ill. Him.* 384, tab. 96. fig. 1.—O. spicatus, *D. Don, loc. cit., non Ker.*—O. minor, *Royle, Ill. Him.* 382.—Fluggea dubia *et* Jacquemontiana, *Kunth, Enum.* v. 304–305.—Ophiopogon indicus, *Wight, Ic.* t. 2050.—O. japonicus, var. intermedius, *Maxim. loc. cit.* Folia linearia 1½–3 lin. lata 7–9-nervata. Scapi sæpe semipedales vel pedales. Racemi laxi 2–6 poll. longi, pedicellis cernuis, inferioribus floriferis 3–4 lin. longis, bracteis lanceolatis pedicellis longioribus, perianthii segmentis 2–3 lin. longis 1–1½ lin. latis, seminibus ad ovarium 3–6. *Himalaya occidentalis et orientalis ad* 9000 *pedes perveniens, Birma, montes Indiæ peninsularis occidentalis et Zeylaniæ.* —O. MOLLIS, *Royle, Ill. Him.* 382, est forma flaccida nemorosa.

Var. F. WALLICHIANA, *Kunth, Enum.* v. 303.—Chloopsis acaulis, *Blume, Enum.* i. 14.—C. caulescens, *Blume, loc. cit.*?—Ophiopogon japonicus, var. Wallichianus, *Maxim. loc. cit.*—O. Malcolmsonii, *Royle, Ill. Him.* 382. Robustior, foliis interdum bipedalibus 3–6 poll. latis 9–13-nervatis subpetiolatis, racemis densioribus, pedicellis brevioribus, floribus majoribus, perianthii segmentis 3–4½ lin. longis 2–2½ lin. latis, bracteis magnis

lanceolatis, seminibus ad ovarium 3–6. *Himalaya orientalis, Birma, Japonia, China australis, Java.*

2. F. JABURAN, *Kunth, Enum.* v. 303.—Ophiopogon Jaburan, *Lodd. Bot. Cab.* t. 1876; *Maxim. loc. cit.*—Slateria jaburan, *Siebold in Act. Bat.* xii. 15.—Convallaria japonica, var. major, *Thunb. Fl. Jap.* 139. Habitus omnino *F. japonicæ*, sed robustior, foliis 1½–3-pedalibus 4–6 lin. latis crebre multinervatis interdum albo variegatis. Scapus complanatus 6–24-pollicaris. Racemus subsecundus subdensus 3–6-pollicaris, pedicellis dense fasciculatis, inferioribus 6–9nis 6–9 lin. longis medio articulatis, bracteis lanceolatis acuminatis persistentibus, inferioribus 9–12 lin. longis. Perianthium 3–4 lin. longum albidum vel lilacino tinctum. Ovula in loculo 2–4. Semina oblonga 4–6 lin. longa. *Japonia in sylvis,* Oldham! Maximowicz! etc.

3. F. GRIFFITHII, *Baker.* Herba acaulis glabra breviter rhizomatosa, fibris radicalibus cylindricis. Folia ad rosulam plura distincte petiolata; petiolus complanatus 2–4-pollicaris; lamina firmula oblanceolata 4–8 poll. longa supra medium 6–9 lin. lata acuta e medio ad basin sensim angustata, facie viridis, dorso glauca, præter apicem distincte costata, venis verticalibus perspicuis crebris percursa. Scapus anceps 4–5-pollicaris. Racemus laxus secundus 3–4 poll. longus, pedicellis arcuatis medio articulatis, inferioribus geminis 2–3 lin. longis, bracteis lanceolatis pedicellis subæquilongis. Flores non vidi. Semina solitaria oblonga cyanea, exsiccata 4 lin. longa. *Himalaya orientalis in sylvis ad Patkaye, alt.* 4500 *pedum,* Griffith 5839!

4. F. DRACÆNOIDES, *Baker in Trimen's Journ.* 1874, 174. Suffrutex subscandens glaber, caulibus crassitie calami basi procumbentibus radices plures adventitias emittentibus ad apices floriferos et nodos laterales foliis productis instructis, inter nodos basibus latis membranaceis foliorum delapsorum cinctis. Folia distincte petiolata (petiolo 1–2½ poll. longo) oblongo-oblanceolata eis *Dracænæ ellipiticæ* omnino consimilia 4–5 poll. longa medio 1½–2 poll. lata acuta basi longe attenuata haud costata crebre multinervata. Pedunculus nudus gracilis terminalis 1–2 poll. longus. Racemus laxus pauciflorus 2–3 poll. longus, pedicellis floriferis cernuis 1–2 lin. longis, inferioribus geminis, bracteis parvis lanceolatis. Perianthium albidum vel pallide lilacinum 2 lin. longum. Semina oblonga 4 lin. longa. *Himalaya orientalis in montibus ditionum Khasia et Sikkim, alt.* 4000–6000 *pedum,* Hook. fil. et Thomson!

Species dubia mihi haud visa.

F. ? PROLIFERA, *Baker.*—Ophiopogon prolifer, *Lindl. in Journ. Hort. Soc.* i. 86; *Miquel, Flor. Ned. Ind.* iii. 569. Rhizoma scandens radicans. Folia glabra ensiformia racemum eminentia. Scapus purpureus. Racemus subspicatus, floribus aggregatis, bracteis ovatis margine membranaceis quam flores sublongioribus. Perianthium parvum albidum. Ovula in loculo

2. Stylus pyramidalis apice tricuspidatus. *In sylvis ad Penang*, T. Lewis in hort. Hort. Soc. Lond. anno 1844.

56. PELIOSANTHES, *Andrews.*

Andrews in Bot. Rep. t. 605; *Endl. Gen.* No. 1194; *Kunth, Enum.* v. 306; *Salisb. Gen.* 63.—Teta, *Roxb. Hort. Beng.* 24; *Fl. Ind. edit. Carey*, ii. 165.—Bulbospermum, *Blume, Enum. Pl. Jav.* i. 15; *Endl. Gen.* No. 1193; *Kunth, Enum.* v. 308.

Perianthium corollinum marcescens rotatum viridulum vel atropurpureum, tubo obconico ovario adnato, segmentis 6 æqualibus obtusis flore expanso patulis tubo longioribus. *Corona* petaloidea faucialis annularis ore subintegro vel 6-dentato. *Antheræ* 6 intra coronam subsessiles oblongæ biloculares introrsum longitudinaliter dehiscentes. *Ovarium* semi-inferum triloculare, ovulis in loculo 2–4; stylus crassus brevissimus apice stigmatoso trilobato. *Semina* maturescentia pericarpium cito rumpentia magna baccoidea turgida oblonga vel globosa, testa carnosa viridi demum atra apice incrassata, albumine corneo, embryone parvo. *Herbæ acaules cæspitosæ, fibris radicalibus duris cylindricis, foliis latis longe petiolatis basi cuneatis venis pluribus longitudinalibus percursis venulis transversalibus connexis, pedunculis centralibus basi foliis haud productis scariosis cinctis, floribus parvis simpliciter racemosis, pedicellis articulatis basi bracteis persistentibus stipatis.*

Pedicelli breves solitarii, inferiores cernui.

Neilgherrienses .... { 1. *P. neilgherriensis.* 2. *P. courtallensis.*

Himalayenses et Malayanæ .... { 3. *P. violacea.* 4. *P. macrophylla.* 5. *P. javanica.*

Pedicelli longiores erecto-patentes sæpissime solitarii.

Species sola .... 6. *P. humilis.*

Pedicelli elongati erecto-patentes aggregati.

7. *P. Teta.* 8. *P. Griffithii.*

1. P. NEILGHERRIENSIS, *Wight, Ic.* t. 2052.—P. longifolia, *Steud. in Hohen. Pl. Can.* No. 1306. Folia ad rosulam 3–8; petiolus ad 6–9 poll. longitudine attingens; lamina oblanceolata vel oblongo-oblanceolata 4–6 poll. longa medio 9–18 lin. lata membranacea venis verticalibus 10–15, 5 quam reliquæ validioribus percursa, venulis transversalibus perspicuis. Scapus 4–6-pollicaris. Racemus laxus secundus 3–6-pollicaris, pedicellis cernuis apice articulatis omnibus solitariis, inferioribus 1–1½ lin. longis, bracteis lanceolatis scariosis, inferioribus 5–6 lin., supremis 1 lin. longis. Perian-

thium atro-purpureum 2 lin. longum, segmentis late oblongis, limbo expanso 3 lin. diam. Os coronæ distincte 6-dentatum. Semina exsiccata subglobosa 3–4 lin. longa. *India peninsularis ad montes Neilgherries,* Wight 2819! Gardner! etc.

2. P. COURTALLENSIS, *Wight, Ic.* t. 2051.—P. Teta, *Wall. Cat.* No. 5083 B. Folia ad rosulam 4–6; petiolus pedalis et ultra; lamina oblanceolata 10–12 poll. longa medio 1½–2 poll. lata membranacea, venis verticalibus circiter 20, 5 quam reliquæ validioribus, venulis transversalibus perspicuis. Scapus complanatus 3–4-pollicaris. Racemus semipedalis sublaxus secundus, pedicellis cernuis apice articulatis omnibus solitariis, inferioribus floriferis 1½–2 lin. longis, bracteis lanceolatis pedicello duplo longioribus. Perianthium atropurpureum 2 lin. longum, segmentis oblongis, limbo expanso 3 lin. diam. Os coronæ profunde 6-dentatum. Semina magnitudine cerasi. *India peninsularis ad montes Neilgherries,* Wight! G. Thomson! etc.

3. P. VIOLACEA, *Wall. Cat.* No. 5084.—P. Teta, *Wall. Cat.* No. 5083, *ex parte.*—P. campanulata, *Wall. MSS.* Folia ad rosulam 4–8; petiolus semipedalis vel pedalis; lamina oblanceolata vel oblongo-oblanceolata 6–12 poll. longa medio 1½–3 poll. lata chartacea, venis verticalibus inæqualibus 20–30 percursa, venulis transversalibus brevibus conspicuis. Scapus 3–4-pollicaris, bracteis paucis vacuis lanceolatis præditus. Racemus subdensus semipedalis, pedicellis omnibus cernuis solitariis brevibus apice articulatis, floriferis infimis 1–2 lin. longis, bracteis lanceolatis scariosis 3–6 lin. longis. Perianthium maximum specierum omnium, viridulum vel violaceo tinctum 3 lin. longum, segmentis rotundis 1½–2 lin. latis, limbo expanso 5–6 lin. diam. Os coronæ profunde 6-dentatum. Semina oblonga, exsiccata 5–6 lin. longa. *Himalaya orientalis, alt.* 0–4000 *pedum,* Griffith 5842! Hook. fil. & Thomson! Keenan! etc. *Birma,* Wallich! Lobb! Parish! etc.

Var. MINOR, *Baker.* Folia minora sæpe semipedalia medio 1½–2 poll. lata. Flores minores viriduli, limbo expanso 3–4 lin. diam. *Himalaya orientalis,* Griffith 5834! 5836! 5838! Helfer 5843! Hook. fil. & Thomson! C. B. Clarke! *Birma,* Wallich! T. Lobb!

Var. CLARKEI, *Baker.* Folia longe petiolata firmiora oblanceolata 9–12 poll. longa medio 1½–2 poll. lata, venis verticalibus 15–20, venulis transversalibus magis conspicuis. Perianthium atropurpureum, limbo expanso 3–4 lin. diam. *Khasiæ montes alt.* 0–4000 *pedum,* Griffith! Hook. fil. & Thomson! C. B. Clarke!

Var. PRINCEPS, *Baker.* Formis reliquis robustior. Petiolus ultrapedalis; lamina sesquipedalis, medio 4–4½ poll. lata, venis verticalibus 30–40, venulis transversalibus perspicuis. Racemus 8–9-pollicaris, pedicellis erecto-patentibus 1–2 lin. longis. Perianthium viridulum, limbo expanso 6 lin. diam. *In Birma prope Moulmein,* T. Lobb!

4. P. MACROPHYLLA, *Wall. MSS. teste C. B. Clarke.* Petiolus pedalis vel sesquipedalis. Lamina pedalis vel sesquipedalis oblanceolato-oblonga chartacea saturate viridis medio 4½–5 poll. lata, venis verticalibus 60–70 percursa, 13–15 quam reliquæ distincte validioribus, intermediis crebris tenuibus, venulis transversalibus brevissimis. Scapus semipedalis vel pedalis, bracteis paucis vacuis lanceolatis instructus. Racemus 6–8-pollicaris superne densus inferne laxus, pedicellis omnibus solitariis cernuis brevibus apice articulatis, inferioribus 1–2 lin. longis, bracteis lanceolatis, infimis 5–6 lin. longis. Perianthium sordide purpureum 3 lin. longum, segmentis late oblongis tubo triplo longioribus, limbo expanso 5–6 lin. diam. Semina globosa exsiccata 5–6 lin. longa. *Himalaya orientalis in ditione Sikkim, alt.* 3000–6000 *pedum,* Hook. fil. & Thomson! C. B. Clarke! *Mishmi,* Griffith 5841! (forma bracteis majoribus, pedicellis longioribus).

5. P. JAVANICA, *Hassk. Pl. Jav. Rar.* 116; *Miquel, Flor. Ned. Ind.* iii. 568.—Bulbospermum javanicum, *Blume, Enum.* i. 15; *Kunth, Enum.* v. 309. Folia ad rosulam pauca; petiolus 2–6-pollicaris; lamina oblanceolato-oblonga 5–6 poll. longa medio 1½–2 poll. lata membranacea, venis longitudinalibus circiter 20 percursa, 5–7 quam reliquæ validioribus, venulis transversalibus inconspicuis. Scapus 2–4-pollicaris, bracteis paucis vacuis instructus. Racemus subdensus 1–2-pollicaris, pedicellis solitariis apice articulatis, inferioribus 3–4 lin. longis, bracteis lanceolatis, inferioribus 5–6 lin. longis. Perianthium viridulum 2 lin. longum, segmentis oblongis tubo triplo longioribus, limbo expanso 3–4 lin. diam. Semina non vidi. *Java,* Zollinger 454, T. Lobb! *Borneo ad Banjarmassing,* Motley 1031!

6. P. HUMILIS, *Andr. Bot. Rep.* t. 634 (forma nana); *Bot. Mag.* t. 1532; *Kunth, Enum.* v. 307.—P. Teta, *Wall. Cat.* No. 5083 C, D, A *ex parte.* Folia ad rosulam 4–8; petiolus ad 6–9 poll. longitudine attingens; lamina lanceolata 3–6 poll. longa medio 1–1½ raro 2 poll. lata membranacea venis verticalibus 15–20 inæqualibus percursa. Scapus 2–6-pollicaris; racemus subdensus 2–6-pollicaris, pedicellis erecto-patentibus prope apicem articulatis, omnibus sæpissime solitariis, inferioribus 3–4 lin. longis raro geminis, bracteis lanceolatis inferioribus 5–6 lin. longis. Perianthium viridulum 1½ lin. longum, segmentis oblongis tubo triplo longioribus, limbo expanso 2½ lin. diam. Os coronæ 6-dentatum. Semina exsiccata oblonga 5–6 lin. longa. *Himalaya orientalis alt.* 4000–6000 *pedum.* Gomez! Griffith 5835! 5844! Hook. fil. & Thomson! etc. *Birma,* Finlayson! Griffith 5837! *Penang,* Maingay 1709!

7. P. TETA, *Andr. Bot. Rep.* t. 605; *Bot. Mag.* t. 1302; *Red. Lil.* t. 415; *R. Br. in Trans. Linn. Soc.* 1817, 8; *Kunth, Enum.* v. 307, *non Wall. Cat.* No. 5083.—Teta viridiflora, *Roxb. loc. cit.* Folia ad rosulam 2–7; petiolus ad 6–8 poll. longitudine attingens; lamina chartacea oblanceolata subpedalis medio 1½–2¼ poll. lata, venis verticalibus circiter 20

valde inæqualibus venulis transversalibus inconspicuis. Scapus 4–6-pollicaris, bracteis paucis vacuis instructus. Racemus laxus 6–9-pollicaris, pedicellis ascendentibus erecto-patentibus aggregatis medio articulatis, inferioribus 3–4nis 3–4 lin. longis, bracteis lanceolatis basi deltoideis inferioribus 4–5 lin. longis. Perianthium viridulum 2 lin. longum, segmentis late oblongis 1 lin. latis tubo duplo longioribus, limbo expanso 3 lin. diam. Os coronæ subintegrum. Semina oblonga ½-uncialia. *Himalaya orientalis in ditionibus Chittagong, Assam, Cachar, etc.* Hamilton! Masters 588! Keenan! etc.

8. P. Griffithii, *Baker.* Folia ad rosulam 5–6; petiolus ad 9–10 poll. longitudine attingens; lamina oblanceolato-oblonga 6–8 poll. longa medio 21–27 lin. lata membranacea, venis verticalibus 20–25, 5 quam reliquæ distincte validioribus percursa, venulis transversalibus obscuris. Scapus brevissimus. Racemus sublaxus 5–6-pollicaris, pedicellis erecto-patentibus apice articulatis, inferioribus sæpissime geminis, superioribus solitariis, inferioribus demum 3–4 lin. longis, bracteis lanceolatis 5–6 lin. longis. Perianthium 2 lin. longum, segmentis oblongis. *Himalaya orientalis in sylvis ad Darjeeling,* Griffith 5840!

Tribus Gilliesieæ.

57. Miersia, *Lindl.*

Lindl. in Bot. Reg. sub t. 992, *et Miers, Travels Chili,* ii. 529; *Endl. Gen.* No. 1175; *Kunth, Enum.* iv. 486; *C. Gay, Fl. Chil.* iv. 100, t. 68.

Perianthium viridulum bilabiatum 6-partitum, segmentis lanceolatis vel linearibus acuminatis, 3 superioribus contiguis ascendentibus, 3 inferioribus contiguis descendentibus. *Stamina* biseriata: 6 exteriora minuta sterilia hypogyna bifida; 6 interiora fertilia, filamentis in urceolum obliquum antice gibbum coalitis, antheris minutis oblongis sessilibus ad urceoli oram sessilibus introrsum longitudinaliter dehiscentibus. *Ovarium* turbinatum triloculare, ovulis in loculo pluribus; *stylus* brevis cylindricus, apice capitato stigmatoso. *Capsula* obovoideo-triquetra membranacea loculicida trivalvis, seminibus parvis turgidis, testa atra crustacea, albumine corneo, embryone minuto. *Herbæ acaules bulbosæ, foliis flaccidis anguste linearibus, floribus parvis umbellatis.*

Perianthii segmenta omnia conformia, lanceolata acuminata.
1. *M. chilensis.*

Perianthii segmenta superiora lanceolata, inferiora linearia.
2. *M. myoides.*

1. M. CHILENSIS, *Lindl. & C. Gay, loc. cit.*—M. major, *Kunth, Enum.* iv. 286. Bulbus ovoideus 6–9 lin. diam., tunicis membranaceis pallide brunneis supra collum haud productis. Folia ad bulbum plura suberecta linearia semipedalia vel pedalia 1–1½ lin. lata. Scapi ad bulbum 1–3 2–6-pollicares. Umbella 4–6-flora, pedicellis ascendentibus 1–2 poll. longis, spathæ valvis lanceolatis viridulis 5–6 lin. longis. Perianthium 4½–5 lin. longum, segmentis conformibus lanceolatis acuminatis 5–7-nervatis. Urceolus stamineus glanduloso-punctatus 1 lin. longus et latus. Capsula 6 lin. longa apice truncata basi cuneata. *Chili,* Cuming 737! Bridges 294! 295! M. CORNUTA, *Philippi, Nuev., Plant.* 1873, 72, ab typo dicitur recedere perianthii segmentis paulo brevioribus, capsulæ carpellis basi breviter cornutis.

2. M. MYOIDES, *Bertero, Exsic.*; *C. Gay, Fl. Chil.* iv. 100.—M. minor, *Kunth, Enum.* iv. 487. Bulbus ovoideus 5–6 lin. diam. Folia producta circiter 4 semipedalia ½–¾ lin. lata. Scapi ad bulbum 2–3 2–3-pollicares. Umbellæ 3–4-floræ, pedicellis 6–12 lin. longis, spathæ valvis lanceolatis 4–5 lin. longis. Perianthium 2 lin. longum, segmentis superioribus lanceolatis trinervatis haud acuminatis, inferioribus linearibus 1-nervatis paulo brevioribus. Urceolus stamineus lævigatus antice valde gibbosus, segmentis superioribus 2–3plo brevior. *Chili,* Bertero, Reed!

58. GILLIESIA, *Lindl.*

Lindl. in Bot. Reg. t. 992; *Endl. Gen.* No. 1174; *Kunth, Enum.* iv. 487.

Perianthium viridulum polyphyllum, segmentis 6 vel 5 (postico intimo obliterato) oblongis vel deltoideis multinervatis, interioribus brevioribus. *Stamina* biseriata: exteriora minuta sterilia subulata pauca vel plura; interiora filamentis in urceolum obliquum coalitis, antice basi utrinque lobo foliaceo cristata et ore antheris tribus minutis subglobosis introrsum longitudinaliter dehiscentibus præditum. *Ovarium* globosum triloculare, ovulis in loculo pluribus; stylus cylindricus, apice stigmatoso trilobatus. *Capsula* chartacea loculicida trivalvis, seminibus multis turgidis globosis, funiculo magno persistente, testa atra crustacea, albumine corneo, embryone axili. *Herbæ acaules bulbosæ, foliis flaccidis radicalibus anguste linearibus, floribus parvis umbellatis.*

Perianthii segmenta 5; staminodia sæpissime integra.
1. *G. graminea.*

Perianthii segmenta 5–6; staminodia 2–3-partita.
2. *G. montana.*

Perianthii segmenta 6; staminodia lineari-subulata.
3. *G. Gaudichaudiana.*

1. G. graminea, *Lindl. loc. cit.*; *Miers, Travels Chili*, ii. 259; *Hook. Bot. Mag.* t. 2716; *Poepp. et Endl. Nov. Gen.* ii. 27, t. 137; *Kunth, Enum.* iv. 489; *C. Gay, Fl. Chil.* iv. 104. Bulbus anguste ovoideus 3–4 lin. diam., tunicis membranaceis pallide brunneis supra collum haud productis. Folia radicalia 2 pedalia vel sesquipedalia flaccida medio 2–3 lin. lata. Scapus unicus gracilis fragilis 1–2-pedalis. Umbella 3–8-flora, pedicellis ascendentibus 1–3 poll. longis, floriferis apice cernuis, spathæ valvis lanceolatis scariosis 6–9 lin. longis. Perianthii segmenta 3 exteriora lanceolata 5–7-nervata 3–4 lin. longa, interiora 2 deltoidea exterioribus 2–3plo breviora. Staminodia 4–6 integra subulata. Urceolus stamineus 1 lin. longus, dentibus 3 anticis antheriferis, 3 posticis sterilibus. Capsula obovoideo-oblonga 5–6 lin. longa. *Chili in graminosis sylvestribus*, Cuming 648! Bridges 215! etc.

2. G. montana, *Poepp. et Endl. Nov. Gen.* ii. 27, t. 138; *Kunth, Enum.* iv. 488; *C. Gay, Fl. Chil.* vi. 103. Habitus et bulbus omnino *G. gramineæ*. Folia linearia pedalia vel sesquipedalia 4–6 lin. lata. Scapus $1\frac{1}{2}$–2-pedalis. Umbella 4–10-flora, pedicellis 1–2 poll. longis, spathæ valvis lanceolatis. Perianthii segmenta exteriora 3, superiora lanceolata 7–9-nervata 4–5 lin. longa, infimum oblongo-lanceolatum; interiora 2–3 exterioribus duplo breviora. Staminodia 6 bipartita vel tripartita urceolo stamineo adnata. Urceolus stamineus dentibus tribus anticis latioribus antheriferis, tribus posticis sterilibus. *Chili australis in Andibus de Antuco*, Poeppig.

3. G. Gaudichaudiana, *Kunth, Enum.* iv. 491; *C. Gay, loc. cit.* Habitus et bulbus omnino *G. gramineæ*. Folia sesquipedalia 2–3 lin. lata. Scapus pedalis et ultra. Umbella 3–5-flora, pedicellis elongatis, spathæ valvis 6–9 lin. longis. Perianthii segmenta 6, 3 exteriora multo majora, oblongo-lanceolata, duplo minora quam in *G. graminea*. Staminodia circiter 6 integra lineari-subulata. Urceolus stamineus dentibus 3 anticis antheriferis, posticis 2 sterilibus. *Chili ad Valparaiso*, Gaudichaud.

59. Trichlora, *Baker*.

Baker in Hook. Ic. t. 1237.

Perianthium viride regulare polyphyllum, segmentis 6 biformibus, 3 exterioribus lanceolatis acuminatis, 3 interioribus multo minoribus obovato-cuneatis. *Stamina* uniseriata: 3 perfecta segmentis exterioribus opposita, filamentis lanceolatis, antheris ovato-globosis versatilibus; 3 segmentis interioribus opposita minuta sterilia squamæformia. *Ovarium* globoso-triquetrum triloculare, ovulis in loculo crebris; stylus brevis columnaris, ramis tribus lanceolatis erecto-patentibus. *Fructus* ignotus.

1. T. PERUVIANA, *Baker, loc. cit.* Bulbus anguste ovoideus membranaceo-tunicatus 5–6 lin. diam., tunicis supra collum productis. Folia producta 3–4 linearia glabra subpedalia flaccida 1½–2 lin. lata. Scapus teres fragilis 6–9-pollicaris. Umbella 4–6-flora, pedicellis ascendentibus 6–24 lin. longis, spathæ valvis lanceolatis vel linearibus 9–12 lin. longis. Perianthii segmenta exteriora 7–8 lin. longa basi 1 lin. lata 4–5-nervata; interiora 1 lin. longa. Genitalia perianthii segmentis interioribus æquilonga. *In Peruvia ad Limam,* Herb. Kew.!

60. GETHYUM, *Philippi.*

Philippi, Descr. Nuev. Plant. 1873, p. 73.

Perianthium atro-purpureo-viridulum regulare 6-partitum, segmentis conformibus linearibus acuminatis, singulis ad basin glandula violacea præditis. *Stamina* uniseriata monadelpha, filamentis deorsum in tubum coalitis superne liberis, antheris tribus superioribus productis intus longitudinaliter dehiscentibus, tribus inferioribus abortivis. *Ovarium* ovoideo-cylindricum triloculare; stylus brevis cylindricus, apice stigmatoso capitato. *Capsula* globosa loculicida trivalvis, seminibus in loculo circiter 3 turgidis subglobosis, testa atra lævi basi in acumen producta.

1. G. ATROPURPUREUM, *Philippi, loc. cit.* Herba bulbosa, foliis linearibus valde elongatis ½ poll. latis. Scapus fragilis elongatus. Umbella 5-flora, pedicellis 4–5 poll. longis, spatha monophylla, bracteolis filiformibus. Perianthium 1 poll. longum atropurpureum basi viridulum, segmentis deorsum 1¼ lin. latis. Stamina 1¼ lin. longa. Capsula 3–4 lin. diam. *Chili ad Penalolen,* Dominæ Cienfugos et Hernandez.

61. SOLARIA, *Philippi.*

Philippi in Linnæa, xxix. 72.—Symea, *Baker in Saund. Ref. Bot.* t. 260.

Perianthium regulare viridulum, basi breviter gamophyllo campanulato, segmentis 6 subconformibus ovato-lanceolatis 3–5-nervatis flore expanso patulis, 3 interioribus paulo minoribus. *Stamina* uniseriata ad faucem tubi inserta, 3 fertilia filamentis brevibus deltoideis antheris subglobosis dorsifixis versatilibus, 3 alterna sterilia minutissima squamæformia. *Ovarium* globosum triloculare, ovulis in loculo pluribus; stylus cylindricus, apice capitato stigmatoso. *Capsula* loculicida trivalvis; semina matura non vidi.

1. S. MIERSIOIDES, *Philippi, loc. cit.*—Symea gillesioides, *Baker, loc. cit.* Bulbus anguste ovoideus membranaceo-tunicatus 1–1½ poll. longus,

5–6 lin. diam., tunicis supra collum haud productis. Folium semper unicum lineare synanthium suberectum semipedale vel pedale, medio 3–4 lin. latum. Scapus gracilis teres 3–10-pollicaris. Umbella 4–10-flora, pedicellis ascendentibus 6–15 lin. longis, spathæ valvis lanceolatis 6–9 lin. longis. Perianthium 4 lin. longum, segmentis tubo 4–5plo longioribus, exterioribus 1 lin. latis. Stamina fertilia ½ lin. longa. Capsula 3 lin. longa. *Chili in ditionibus Santiago et Linares,* Philippi! Reed! Germain.

62. Erinna, *Philippi.*

Philippi in Linnæa, xxxiii. 266.

Perianthium viridulum regulare, tubo brevi gamophyllo campanulato, segmentis 6 lineari-lanceolatis conformibus uninerviis. *Stamina* uniseriata ad faucem tubi inserta: 3 fertilia, filamentis brevissimis, antheris lineari-oblongis introrsum longitudinaliter dehiscentibus; 3 sterilia cum fertilibus alternantia subulata perianthii segmentis æquilonga. *Ovarium* globosum triloculare, ovulis in loculo pluribus; stylus cylindricus, apice stigmatoso trilobato. *Fructus* ignotus.

1. E. gilliesioides, *Philippi, loc. cit.* Herba bulbosa, foliis radicalibus 3 linearibus 6–8 poll. longis circiter 1 lin. latis. Scapus semipedalis. Umbella pauciflora, pedicellis ½–8 lin. longis, spathæ valvis lanceolatis 5–7-nervatis 8–12 lin. longis. Perianthium 4 lin. longum, tubo vix 1 lin. longo, segmentis peracutis. Pistillum in tubo inclusum. *Chili ad Santiago,* Philippi.

63. Ancrumia, *Harvey, MSS.*

Harvey; Baker in Hook. Icones, t. 1227.

Perianthium regulare viridulum, tubo gamophyllo campanulato, segmentis biformibus flore expanso falcatis, 3 exterioribus lanceolatis multinervatis acuminatis, 3 interioribus linearibus. *Stamina* triseriata: exteriora 6 minutissima sterilia squamæformia; intermedia 6 minuta sterilia squamæformia; interiora 3, 2 perfecta, filamentis linearibus, antheris lineari-oblongis versatilibus, tertium sterile squamæforme. *Ovarium* triloculare, ovulis in loculo pluribus; stylus filiformis, apice stigmatoso capitato. *Fructus* ignotus.

1. A. cuspidata, *Harv. MSS.; Baker, loc. cit.* Bulbus ovoideus tunicatus 8–9 lin. diam. Folia 1–2 synanthia linearia flaccida subpedalia medio 3–4 lin. lata, venis crebris immersis. Scapus nudus gracilis teres fragilis sesquipedalis vel bipedalis. Umbella 6–12-flora, pedicellis 1–4 poll. longis, apice cernuis, spathæ valvis lanceolatis scariosis 15–18 lin. longis. Perianthium 12–18 lin. longum, segmentis exterioribus 3 lin. latis, tubo 3–4 lin. longo. Genitalia tubo subæquilonga. *Chili in arenosis ad Guayacan prope Coquimbo,* Buchanan (icon!), Harvey!

On the Origin of the so-called Scorpioid Cyme.

By the Rev. GEORGE HENSLOW, M.A., F.L.S.

[Abstract, read November 6, 1879.]

THIS paper in full, with a Plate, will appear in the Society's 'Transactions.' The points of importance to which the author called the attention of the Fellows in the reading of the paper may be thus summarized.

He pointed out some errors in deducing the scorpioid from the dichotomous cyme, as follows :—

1. Opposite pairs of bracts being successively in planes *at right angles* to each other, the resulting sympode would be a volute, and not a helix.

2. The position of the bracts (when present, as in *Borago*) is such that they are not opposite to the flowers.

3. There are always two rows of flowers, not a single row, as would be the case.

4. The appearance of a flower in the fork between the two branches of the inflorescence (as in *Myosotis*) is not usual, and is due to the adhesion between the terminal and the highest axillary raceme.

5. The peculiar arrangement of the flowers has given rise to the supposition that there is a dichotomy of the apex—that while one half continues the axis, the other becomes a flower. The author, however, points out that there is no practical difference between the actual condition presented and lateral budding; so that this theory would seem to be superfluous.

Authors have hitherto confounded "the true scorpioid raceme" (Henslow) with spicate degradations of a sympodial inflorescence.

He (Mr. Henslow) refers it to the indefinite system, and explains its origin by a new principle of phyllotaxis, which he first discovered in *Lagerstrœmia*, viz. in resolving opposite and decussate leaves into alternate, instead of their lying on a continuous spiral line, the line *oscillates* through three fourths of a circle; and if such a line be drawn from flower to bract, it will represent the so-called scorpioid cyme of the Boragineæ. An intermediate stage is represented by the inflorescence of *Lathræa squamaria*.

This consists of four vertical rows of bracteate flowers; and a line drawn through each successive bract, and projected on a plane, corresponds with the projection of a similar line for *Borago*.

Note on the Structure and Habit of *Hemileia vastatrix*, the Coffee-leaf Disease of Ceylon and Southern India. By D. MORRIS, B.A., Trin. Coll. Dubl., F.G.S., Director of the Botanical Department, Jamaica, late on special duty, Coffee-leaf Disease Inquiry, Ceylon. (Communicated by W. T. THISELTON DYER, M.A., F.L.S.)

[Read November 6, 1879.]

THE subject of the present note was first described by the Rev. M. J. Berkeley in the 'Gardener's Chronicle' for 1869 (p. 1157, with woodcut). It was afterwards included in the list of Ceylon Fungi determined by Messrs. Berkeley and Broome, and published in the Linnean Society's Journal (Botany, vol. xiv. p. 93, pl. iii. fig. 10). A short notice appeared in the 'Quarterly Journal of Microscopical Science,' 1873, pp. 79-81*; and last year the subject was treated in greater detail by the Rev. R. Abbay, in a paper read before this Society, June 6, 1878 (Journ. Linn. Soc. Botany, vol. xvii. pp. 173–184, pls. xiii. & xiv.), which added considerably to our knowledge of the subject.

The leaf-disease, as mentioned by Mr. Abbay, first appeared in Ceylon in May 1869; and it soon spread with rapid strides over the cultivated and native coffee of the island. It was noticed in the coffee-districts of Southern India during 1869 and 1870, almost simultaneously with its appearance in Ceylon. In 1876 it was reported on coffee in Sumatra and Bencoolen; and this year (1879) the Director of the Botanic Garden at Buitenzorg, Java, reports its presence on the coffee-estates of that island in a severe form.

It is evident, therefore, that *Hemileia vastatrix* is gradually extending its ravages over the whole of the coffee-producing areas of the East Indies; and unless decisive steps are taken to con-

* In 1876 Dr. M. C. Cooke described and figured the fruit from Indian specimens, in the India-Museum Report, 1876, pp. 4–6.

tend with the pest, it is not improbable that it will spread to the West Indies and Brazil, and prove a general enemy to the coffee enterprises of both tropics.

As is now well known, the disease consists of a minute fungus which appears as a parasitic growth within the parenchymatous tissue of the coffee-leaf. Its fruit, which appears on the under side of the leaf, is composed of numerous clusters of orange-coloured sporanges borne on minute tufts of threads protruded through the stomata. The disease affects the coffee-tree by the repeated destruction of its leaves, thus gradually weakening it till it succumbs.

The effects of the leaf-disease upon the exportation of coffee from Ceylon may be very distinctly traced. In 1869–70, before the disease appeared generally upon the coffee-estates, Ceylon exported 1,009,206 cwt. of coffee, consisting of 860,707 cwt. plantation-coffee and 148,499 cwt. native coffee. In 1876–77, when there were 52,000 more acres in bearing, the total exports were only 797,763 cwt., viz. 727,420 cwt. plantation-coffee and 70,343 cwt. native coffee. The average annual deficiency in crop, owing to the presence of leaf-disease in Ceylon, is estimated to represent a loss of not less than £2,000,000.

During the present year (1879) an earnest and, it is to be hoped, successful attempt has been made in Ceylon to find means for checking the ravages of the disease. A leaf-disease inquiry was appointed by the local Government; and a series of experiments were instituted, with the cordial cooperation of the Planters' Association and the Chambers of Commerce. As during the inquiry several points of interest have been noticed bearing upon the structure and habit of the *Hemileia*, these are described, with the view of supplementing the information already laid before the Society on a subject of so great and increasing importance.

In Mr. Abbay's paper just mentioned, the chief points added to our previous knowledge of the fungus consisted in determining that the fruit was composed of sporanges containing a number of sporidia or spores, and that when grown under artificial conditions, the mycelium of the fungus very frequently produced conidioid forms of fruit, termed by Dr. Thwaites in 1874 "secondary spores." These latter were produced "in the form of radiating necklace-shaped strings of spherical bodies of uniform size, closely resembling the fructification of an *Aspergillus*." Mr. Abbay

also described and figured the germination of the spores and the various characters assumed by the mycelial growths.

The facts elicited during the late coffee-leaf-disease inquiry confirm Mr. Abbay's conclusions respecting the structure of the fruit.

Previous to the appearance of Mr. Abbay's paper, descriptions of the disease had been confined to the character of the fruit and the appearance of the mycelium in the parenchymatous tissue of the leaf immediately beneath. Indeed little more could be done while the examination was confined to dried leaves sent home from India and Ceylon. Mr. Abbay having resided in Ceylon for some years and been associated with Dr. Thwaites, F.R.S., C.M.G., the distinguished Director of the Botanic Gardens, in his earlier investigations, was in a position to give interesting details respecting the nature and habits of the disease.

The fruit of the *Hemileia*, as first pointed out by Mr. Abbay, is evidently composed of sporanges; for not only can the enclosed sporidia or spores be seen, but these bodies, on being sown, gave rise to mycelial growths, each being the product of a single spore. Sometimes the spores escape from the sporange and germinate in the immediate neighbourhood. On examining the sporanges found on an old disease-spot, many of the sporanges are noticed to be turned with the smooth under surface uppermost, and to be entirely, if not quite, empty.

Mr. Abbay describes and figures the spores as being attached to the inner surface of the sporange. This is quite opposed to the received ideas respecting free-cell formation; and some care has been bestowed in determining the nature of the so-called attachment. When the sporanges are placed in a drop of water between two slips of glass and subjected to pressure, the outer wall is soon ruptured and spores float out. I have never been able to detect that they are in any way attached to the wall of the sporange; but they appear as globose bodies about one tenth the size of the latter.

Dr. M. C. Cooke, in the India-Museum Report, 1876, p. 5, mentions that in specimens from Southern India the wart-like papillæ which cover the outside of the sporange sometimes become detached. From the description and relative size of these bodies given by Dr. Cooke, I am disposed to believe that, in consequence of the imperfect character of the specimens sent to the India Office, Dr. Cooke mistook the spores for the deciduous wart-like

papillæ. The latter are elongate and peltate, and much more minute than the normal spore.

When describing the character of the mycelium inside the tissue of the leaf, Mr. Abbay mentions that a dark body is seen immediately beneath each of the clusters of sporanges, and that from these bodies a branching mycelium, more or less charged with reddish-brown granular matter, ramifies amongst the cells of the leaf. Of the exact nature of these dark bodies, Mr. Abbay is unable to speak with accuracy. On a careful examination of a section taken through a stomate, the dark body is found to occupy the air-cavity immediately beneath; and when soaked for some time and subjected to slight pressure, instead of being "sacs of the shape and size of the air-cavity," these bodies are found to be composed of a number of densely interwoven threads, which are continuous with those permeating the tissues of the leaf, and directly connected with the fine tufts of threads which push their way through the mouth of the stomate and bear the cluster of orange-coloured sporanges. A figure of the complete plant of the *Hemileia* is given in the accompanying woodcut.

Cluster of sporanges arising from a mass of interwoven mycelial threads, as described in the text. Magnified.

In Mr. Abbay's paper little is said about the presence of the mycelium outside the coffee-leaf. During several months of the year, when the disease was supposed to be absent from the coffee-estates, it exists as filamentous threads, produced by the germinating spores, and covering the bark and leaves of the coffee-tree. In districts affected by the south-west monsoon these filaments are so abundan during the months of February, M rch, and April, that it is impossible to gather a single well-matured coffee-leaf entirely free from them. During the prevalence of wet weather the filaments do not appear to enter the stomata, but continue to remain as external growths. In this stage Mr. Abbay describes them as producing the conidioid form of fruit; but during several months' continuous observation upon coffee-estates I have not observed a single instance of conidia being produced by the filaments while on the coffee-leaf. They, however, appear frequently when the

filaments are grown on glass slides and kept in a starved condition.

On the upper surface of rather old coffee-leaves I have noticed that there is a strong tendency on the part of the external filaments to form little knotted masses, which remain (and especially during the dry season) in a resting stage. The chlorophyll is often wanting under these little knots, and consequently there is a slight transparency when the leaf is held up to the light. On the return of wet weather fresh growths arise from these centres, and characteristic filaments spread over the leaves.

The existence of the disease in the filamentous and external form offers a favourable opportunity for treating it with some of the specifics that have proved so successful in the treatment of the hop and vine mildew; and the object of the late leaf-disease inquiry was to observe the results of experiments carried on with sulphur, lime, salt solutions, and other materials offering some hope of success. Though there is a well-marked periodicity in the worse phases of the disease, the prevalence of large areas of abandoned and ill-cultivated coffee, on which the disease is found in almost every stage of development, is a disturbing element which seriously affects the prospects of success. It was found experimentally that an application of flowers of sulphur and coral lime, dusted by hand into the trees, very effectually destroyed the external filaments of the disease; and it was believed that, if this were carried out generally before the disease entered the leaves, there would be a great diminution in the prevalence of the disease during the following season. It was found that the cost of materials, together with the expenses of application, would not exceed the rate of £2 per acre.

In the reports lately presented to the Legislative Council of Ceylon the results of the leaf-disease inquiry are given at some length; and it is to be hoped that during the coming season satisfactory evidence will be forthcoming that the disease can be effectually treated. Great prominence is given to the necessity which exists for removing all old and sickly trees, and uprooting coffee-plants growing without care or cultivation on abandoned estates and native gardens. Such trees appear to be the worst sufferers from leaf-disease, and, while they remain, are a continual source of danger to well-cultivated estates. One severely diseased tree is sufficient to infect all trees in its immediate neighbourhood; and on that account a strong conviction is expressed in the

reports that little good can be expected from remedial measures of any kind unless great care is taken to prevent the disease finding an asylum on abandoned coffee.

The cultivation of tea, cinchona, cacao, Liberian coffee, and other products has latterly been greatly extended; and it is very probable that by reducing to some extent the present areas of the coffee-districts and carefully cultivating the remainder, there will be much more favourable results obtained by the application of suitable remedies.

On the Discovery of a Variety of the Cedar of Lebanon on the Mountains of Cyprus; with Letter thereupon from Sir Samuel Baker, F.R.S. By Sir J. D. Hooker, C.B., K.C.S.I., F.R.S.

[Read November 20, 1879.]

I TAKE the earliest opportunity of bringing under the notice of the Linnean Society the unexpected discovery of a form of the Cedar of Lebanon in the mountains of Cyprus, as communicated in the accompanying letter from Sir Samuel Baker addressed to myself—a discovery which is the more remarkable as the botany of Cyprus has been explored of late years by a botanist and collector so distinguished as the late Theodore Kotschy, and it had formerly been visited by many intelligent travellers, including Sibthorp, who collected 616 species in the island.

"Cyprus,
24th Sept. 1879.

"Dear Sir Joseph Hooker,

I am about to leave this island, after nine months' agreeable inquiry into all that pertains to it. I thought I knew all the varieties of trees, until, a short time ago, the old monks of Trooditissa Monastery assured me that they considered the Scriptural 'Chittim wood' to be a species of Pine, which only exists upon the mountains between the monastery of Kyker and the town of Khrysokus. I have been over every portion of the island, excepting the small region of pathless and almost inaccessible mountains alluded to. I immediately sent a trustworthy messenger to find the trees, and to cut off and bring me a bough.

"He has returned and brought with him some boughs of a Cedar, which is the wood in question. It is exceedingly dense

in foliage. The trees are very scarce, and grow in a secluded spot among the mountains. I think it is a new variety. At all events, I have given the boughs to the highest authorities here to be sent to you; and I have recommended them to collect the seed, which will be ripe in November. The wood is reported to be superior in quality to any in the island.

"No species of Cedar exists in any other portion of Cyprus.

"Much has been written concerning the trees and plants by persons who are inexperienced; and the dwarf Cypress has been confused with Juniper, to which, of course, it bears no resemblance.

"I have found two varieties of Cypress. No. 1, a tree averaging a girth of 6 or 7 feet at maturity, and a height of 30 feet, with a cedar-coloured wood, emitting a powerful aromatic scent resembling Sandal-wood. This is, in my opinion, the celebrated 'Chittim wood.' Why should Solomon have sent for Cedar, which is so common in Asia Minor? The No. 2 variety of Cypress is an intensely hard wood, resembling somewhat Lignum vitæ. This never grows higher than 20 feet, and seldom exceeds a girth of 2 feet 6 inches.

"Sincerely yours,

"SAMUEL M. BAKER."

Shortly after the receipt of the above, I had the gratification of receiving, through the kind offices of the Marquis of Salisbury, the magnificent specimen of the Cyprus Cedar procured by Sir Samuel Baker, and which I have now the pleasure of exhibiting. It differs, as will be seen, from the known forms of *Cedrus* in the shortness of the leaves and the smallness of the female cones, and perhaps also in other characters, which, owing to the immaturity of its cones, the specimen in question does not admit of being investigated. I shall therefore confine myself to suggesting its bearing the varietal name of *Cedrus Libani*, var. *brevifolia*; and I may assume that for arboricultural purposes the trivial name of "Cyprus Cedar," as distinguishing it from all other forms of the genus, will be accepted.

In an account of the known forms of the genus *Cedrus*, which I communicated to the 'Natural History Review' for the year 1862 (p. 11), I brought together some observations that I had made on the different so-called species of *Cedrus*, and endeavoured to establish the conclusion that the now isolated Cedars

of the Himalaya, Lebanon, the Taurus, and Algeria were races of one formerly more generally distributed tree, and that their isolation was due to geographical and climatal changes in the area over which the species was distributed. Under this point of view it becomes very important to determine to which of the known races of Cedar that of Cyprus most nearly approaches: this can only be satisfactorily done on the arrival of ripe cones and seeds, which I am assured I shall receive very shortly. Meanwhile I may state that, in size of cone, and size, form, and colour of leaf, the Cyprus approaches the Algerian far more closely than it does any Taurian, Himalayan, or Lebanon Cedar.

A Contribution to our Knowledge of the Embryo-Sac in Angiosperms. By H. Marshall Ward, B.A., Scholar of Christ's Coll., Cambridge. (Communicated by W. T. Thiselton Dyer.)

[Read November 20, 1879.]

(Plates XVII.–XXV.)

*Preliminary Remarks**.

Being engaged during the past summer in an investigation† concerning the origin of the embryo-sac in Angiosperms, the paper by Vesque, in Ann. d. Sc. Nat. 1878, naturally came under consideration. I there found, among others, drawings of the embryo-sac in *Butomus* with which my own by no means agreed; and on pursuing the matter further, I drew up the following account and drawings in the form of a paper, that is now laid before the Society in the hope that it may serve to throw some light on the important question of the morphological signification of the ovule and embryo-sac.

On pursuing the investigation, and extending observations to other plants, it appeared possible that the structure of the ovule in *Butomus* might turn out to be a key to the understanding of what occurs in other ovules—that some common law of growth

* The general method followed in the preparation of the microscopic specimens in the present research has been to treat fresh ovaries with absolute alcohol, afterwards adding glycerine, and therein retain for some hours.

† Most of the work in this paper was done at Kew, in the "Jodrell Laboratory."

and cell-division lies at the foundation of the whole, and, therefore, that one cannot expect to recognize a prothallus or a spore &c. from the methods of cell-division. Hence I describe the structure and processes in *Butomus* in some detail—though it is to the drawings one trusts for the facts; for they have been made with the greatest care, and are selected from a great number of preparations.

Embryo-sac of Butomus umbellatus. (Plates XVII.–XIX.)

An excellent series of figures in Sachs's 'Text-Book' (3rd edit. p. 489) renders it unnecessary to dwell upon the relations of the ovule to the ovary; and I may at once describe the structure of the earliest protuberance as it projects perpendicularly from the surface of the placenta into the hollow of the carpel.

It arises as an emergence from the cells of the carpel-wall, the lining of which is continued, epidermis-like, over it (Pl. XVII. fig. 1). From the first there is a regularity of arrangement of the constituent cells, which becomes better expressed (Pl. XVII. fig. 2) in a little later stage, as a central or axial row of cells covered in a dome-like manner by a layer one cell thick, over which in turn the aforesaid epidermal layer* passes. We have, in short, a process of subepidermal cell-division pushing up the epidermal lining of the ovary. The cells for some time divide only by walls perpendicular to the very regular surface of the young ovule; and each is completely filled with clear or faintly granular protoplasm, the greater part of which forms a large spherical nucleus, with a bright nucleolus in its centre.

When the axial row has acquired about eight cells, the young ovule-rudiment begins to show signs of asymmetry; the cells of the distal half (with reference to origin on the carpel) are larger, and so cause this part to appear somewhat swollen and the whole ovule club-shaped; while certain of the subepidermal cells divide and cause a protrusion on one side. Thus is established the origin of the inner integument (Pl. XVII. figs. 3 & 4); and this causes the ovule to have its apex directed upwards in the carpel, whence the observer is compelled to cut longitudinal sections of the ovary for the satisfactory preparation of several succeeding

* There is no advantage in the usage of any special term for the epidermal lining of the carpels.

stages. Now, too, for the first time is evident a difference in the appearance of one cell of the axial row: the terminal cell of this series has become slightly larger and more granular; while its nucleus is sharply rounded, with an exceedingly bright nucleolus (Pl. XVII. fig. 4). This cell is clearly becoming distinct from its neighbours; and we shall have no great difficulty in demonstrating that it produces the embryo-sac as a daughter cell or cells: we may accept the term "embryo-sac mother cell" for it*.

As a rule, this upward direction of the whole ovule also indicates the first bending on itself of the normally anatropous ovule; but there occur ovules which attain maturity, and have otherwise a normal structure, which, however, never curve at all, but the nucellus† with its integument sits in an orthotropous manner on the end of a long funiculus projecting perpendicularly from the placenta.

From the point where the curvature may be said to begin, and which marks junction of funiculus and nucellus, the "axial row" soon ceases to be distinct; and the cells, by elongation and division, later help to form the feeble fibro-vascular bundle of the funiculus; above this point, however, they persist to the end as a series of a few cells, and may be recognized even in fertilized ovules. The importance attached to this will be shown hereafter.

Soon after the mother cell of the embryo-sac becomes recognizable by its nucleus and contents, active division is set up in the cells around the axial row, so that, by walls parallel to the periphery of the whole organ, there is soon cut out, as it were, a second subepidermal layer or hollow cylinder (Pl. XVII. figs. 4–8). The embryo-sac mother cell has now become much longer, and in the shape of an inverted truncated cone, resting on two or three cells of the axial row; while the inner integument, growing up around the nucellus, is soon followed by a second integument, which arises at its base by divisions similar to those with which this started (Pl. XVII. figs. 5 & 7, and Pl. XVIII. fig. 8). We have now the typical anatropous ovule, since the funiculus becomes closely applied to one side from the first sharp bend.

* See Warming, "De l'Ovule," and Vesque, "Développement du sac embryonnaire," Ann. des Sc. Nat. 1878.

† The word *nucellus* is employed throughout this paper to mean the *nucleus of the ovule*, in the same sense as that phrase is used by English writers.

Before proceeding to describe the changes which result in the formation of the embryo-sac, I propose to dwell on certain peculiarities of cell-growth, division, and arrangement shown by such an ovule as this, since it appears probable that many phenomena common to such structures are related more or less simply to the distribution of the cells.

Disregarding the integuments and funiculus, a comparison of the figures shows that we have in the nucellus a body growing upwards and outwards from its base (the so-called chalaza) ; and a remarkable connexion is evident between the arrangement of the cells and the distribution of growth in the organ. For instance, in Pl. XVII. fig. 7 the diameter of the nucellus has somewhat evenly increased in a direction perpendicular to the long axis; and to effect this, the subepidermal cells have each become divided by a wall parallel to the periphery. This is well seen in Pl. XVII. fig. 8, which is drawn from a section across the middle of an ovule like Pl. XVII. fig. 7. And another fact is illustrated at the same time: the layer of cells thus cut off outside at once divide by radial walls (that is, walls perpendicular to the periphery of the organ), and so by doubling their number fill up the larger space; and it will be noticed that a similar division is made by the epidermis, which has a larger surface as it is pushed out by the widening mass beneath.

So, too, the integuments must provide for increased surface by more walls in vertical and radial planes. As the nucellus increases in volume, growing forwards by additions at its base, and by cell-divisions in planes perpendicular to the long axis, its form changes from almost cylindrical to more or less egg-shaped, with the narrow end free; and a corresponding increase in the number of cells occurs. It is not perhaps possible to state clearly the relations between the form of the ovule and the distribution of the cells; but we may note some peculiarities in this connexion*. The most obvious fact is the general perpendicularity of the cell-walls to the walls they cut; this is true especially of the epidermal cells, but applies to others as a rule when first formed.

A second peculiarity is that in the completed ovule the cells of the nucellus are, except the axial series, arranged in rows of which the directions radiate from the lower third of the central mass to

* See also a paper by Sachs in Würzburg Arbeiten, "Anordnung der Zellen in jüngsten Pflanzentheilen."

the periphery, curving outwards so as to cut the epidermis at right angles, or nearly so. This is plainly seen in Pl. XVII. fig. 10, and Pl. XVIII. figs. 1 and 3; and comparison with younger stages shows transitional states.

Thirdly we may note the constancy of volume of any two sister cells, again excepting the axial series. It appears as if, when a cell has become of a certain size, it were in some way impelled to divide by a wall perpendicular to its side walls; each sister cell then repeats; and thus the increasing volumes of outer layers are filled up. In the older stages this is less evident, and we see more cubical cells at the base and narrower elongated ones higher up.

Can we in any way explain the form of the ovule by the cell distribution, or *vice versâ*? On looking at an active young ovule at a stage such as in Pl. XVII. fig. 7, one is struck by the vigorous appearance of all the cells, and those of the nucellus itself not less than of the integuments: the cells of the epidermal layer of the nucellus are becoming divided by walls in perpendicular planes at right angles to the whole surface; *i. e.* the surface of the nucellus is becoming increased. Such an increase means reduced pressure on the cells immediately underneath, and not only that, but also a positive stretching in a direction parallel to the surface of the nucellus; hence they have room to grow laterally and forward (*i. e.* in a tangential and radial direction); and if one compares Pl. XVII. figs. 8 to 10, and Pl. XVIII. figs. 1 and 3, the correspondence between some such explanation and the facts appears at least probable*.

Following any of the radiating groups of cells in an advanced ovule (such as in Pl. XVIII. fig. 3), we see that as it reaches the surface of the nucellus there are more cells to cover the greater area, and that these cells are very definitely arranged: it would appear in fact as if the cells could not increase beyond a certain size without a division-wall appearing; and having more room towards the periphery of the ovule, we therefore have more cells. But if we examine the axis of the ovule, it appears that the same applies here also; probably the diminished pressure at the apex has a direct bearing on the elongated form of the axial cells. Of course it is not suggested that the process of formation of an

* In all these considerations the integuments may be neglected for simplicity.

ovule is so simple as here sketched, but that some general law of growth and cell-division is at the bottom of the question.

So far as the manner of cell-division is concerned, we cannot argue that the central row differs from any other radial group of similar construction. This row, however, is favourably situated for receiving stores of nutriment to be applied for any special purposes; and its protected position appears to have been taken advantage of in the formation of an embryo-sac, to which process we now turn. If the ovule of *Butomus* be compared with that of *Rosa**, or others where several embryo-sacs appear to occur, the same remarks apply, but apparently more cells at the centre have become utilized.

As the nucellus grows, and the integuments rise, the somewhat obconical cell in Pl. XVII. figs. 5–7 becomes longer and its nucleus larger, and then at its front end gives off a cell by the formation of a wall across its foremost third or quarter (Pl. XVIII. fig. 4). This wall is sharply marked in the centre, but very deliquescent and swollen at the surfaces bounding the protoplasm. The foremost cell so cut off acquires a nucleus, but does not increase much in size, as does its sister cell below.

Very shortly the enlarged lower cell repeats the above process, and (Pl. XVIII. fig. 5) a second cell is cut off in an exactly similar manner. The lower cell again enlarges, and its nucleus becomes bright and round; and as the cell lengthens, the two sister cells above are seen to become more and more deliquescent as the larger cell in its growth forces them upwards and compresses them against the epidermal cells at the apex. But it may often occur (perhaps always) that the cell first cut off becomes divided by a perpendicular wall into two (Pl. XVIII. fig. 7), just in the same way that the terminal cells of the other groups divide immediately under the epidermis; in fact, here again it looks as if the greater room for growth immediately under the epidermis were answered to by the freer cell becoming divided.

In a short time after, however, both the cells cut off by the larger cell are seen to be flattened and rendered a mere refractive cap on this lower cell by its vigorous growth upwards (Pl. XIX. figs. 2 to 6, &c.); and finally the mass disappears altogether. At the same time, by a similar process of deliquescence

* See Strasburger, 'Die Angiospermen u. d. Gymnospermen,' 1879.

and pressure, the cells of the other groups in the fore part of the nucellus are seen to gradually lose their outlines and become finally absorbed into a common cavity (Pl. XVII. fig. 10, Pl. XVIII. fig. 1, and Pl. XIX. fig. 5, &c.) as the ovule attains maturity. This enlarging remnant of the "embryo-sac mother cell," which has so important an influence on the surrounding cells, is the embryo-sac.

The processes which take place in the developing embryo-sac are extremely interesting, but somewhat difficult to follow in detail from the rapidity with which they occur, and also the length of the sac, which makes it by no means easy to obtain longitudinal sections through its whole course. The examination of several thousands of ovules has yielded the following results, which are in the main similar to those described by Strasburger in *Orchis* and others. The nucleus divides, each new nucleus passing to an opposite end of the sac, and being imbedded in a mass of protoplasm (Pl. XIX. figs. 1–6); as these separate a vacuole-like clear space* forms between, and at last occupies the greater portion of the sac, driving the protoplasm to the walls, where it forms a more or less continuous lining.

Each of these nucleated masses of protoplasm then undergoes further division in its respective end of the sac; in Pl. XIX. fig. 7 the upper one has formed four nuclei arranged in a tetrahedron, while the lower one only appears to have formed two masses, though in other cases four appear here also (Pl. XIX. fig. 9). At first these are all alike, but very soon become altered in size and position.

First, one of the upper four nuclei passes down into the cavity of the sac, either in the protoplasm of the lining wall, or suspended by "bridles" from this—a process which is imitated in the reverse direction by a nucleus from below (Pl. XIX. fig. 8). These two nuclei approach one another about the middle of the sac (Pl. XIX. fig. 9), and come into contact (Pl. XIX. fig. 10), finally blending into one large, sharp, and refractive nucleus suspended somewhere about the central part of the sac. This is the "nucleus of the embryo-sac" (Pl. XIX. fig. 11). Meanwhile a sister nucleus of the upper group enlarges, and becomes very bright and sharply spherical as the "egg-cell" (oosphere, em-

* I shall suggest later that this may be a cell-wall even more deliquescent than those preceding it in the "embryo-sac mother cell."

bryonic vesicle); it has no discernible envelope, but an especially conspicuous nucleus; and it becomes attached by the surrounding protoplasm on the wall of the embryo-sac apex just below the other two nuclei, which remain about the same size as at first, and appear to be Strasburger's "synergidæ." In most preparations a vacuole appears under each in the surrounding protoplasm (Pl. XIX. figs. 9-11). The two "synergidæ" and the suspended "egg-cell" together form the "*egg-apparatus.*"

The nuclei at the opposite end of the embryo-sac remain unchanged, apparently, and are the "antipodal cells" of authors. Even in Pl. XIX. fig. 9, the best instance of three of these "antipodal cells" I have obtained, the third nucleus is very faintly marked off from the mass of protoplasm in which all are imbedded; and consideration renders it probable that the completion of the division into four is not necessary*; and it is possible that in Pl. XIX. figs. 7 and 8 only one antipode remains. However this be, we have in *Butomus* an excellent type of "egg-apparatus" and "embryo-sac nucleus," with at least sometimes three "antipodal cells." What explanation can be offered for these remarkable structures?

The general theory promulgated by Strasburger is to the effect that the division into $2 \times 2 \times 2$ of the nuclei in the embryo-sac is the process of formation of a reduced prothallium by the protoplasm of the embryo-sac, which, therefore, is a macrospore. He further believes that the egg-cell is an archegonium reduced to its oosphere, while two of the prothallus-cells become (synergidæ) of use in the act of fertilization by the pollen-tube†. He cannot explain the fusion of the two nuclei, but believes that the process has some bearing on the formation of endosperm in those ovules which produce it‡. The antipodal cells, according to this view, are merely vegetative cells of the rudimentary prothallus.

Vesque and Warming, on the contrary, believe that we have in the angiospermous nucellus an organ comparable to an anther in some respects. Vesque describes the formation of an embryo-sac mother cell as above in the main, but believes that at least

* See in this connexion the remarks on *Gymnadenia*, 'Quart. Journ. Micr. Science,' Jan. 1880.

† They appear to receive the pollen-tube, and act as carriers of its influence to the egg.

‡ See, however, a paper by Darapski in Bot. Zeitung, August 1879.

two of the cells cut off by transverse partition of this cell become, by the dissolution of their separating walls, blended to form the embryo-sac—that one of the tetrahedral groups of nuclei is formed by one of these cells, the other by another. Hence, these authors contend, we have a process exactly comparable to what occurs in an anther, where a subepidermal cell cuts off two or more cells at its peripheral end, and becomes the mother cell of pollen-grains, which form in tetrahedral groups of four within each mother cell. Suppose (they argue) two apposed mother cells to fuse, and you have a process substantially similar to what occurs in the formation of the embryo-sac.

These observations, as far as the embryo-sac itself is concerned, are chiefly due to Vesque; and the conclusions drawn are that the embryo-sac is not a spore, but a spore- mother cell (or, rather, a fusion of several spore- mother cells), that each of the synergidæ, the egg-cell, antipodes, and embryo-sac nuclei is morphologically a *spore*. No explanation is offered for the fusion of the embryo-sac nuclei.

But at the outset we must take exception to Vesque's description of the processes, confining ourselves here to a criticism of his remarks and figures on *Butomus*.

He admits a difficulty in the case of this plant: though the observation is very easy, the processes do not fit the general theory very readily. He says* a cell of the nucellus enlarges, and terminates inferiorly in a point where it abuts on two subjacent cells; if the reader compares Vesque's figs. 13 and 14 with Plate XVII. figs. 1–4 of this paper, it will appear that Vesque has overlooked the central row of cells here insisted upon; a slightly oblique section, or a focus too high or too low in the solid cell-mass might give such a figure as his.

Vesque then figures the first division in this enlarged cell; and his fig. 15 (with above correction) agrees pretty well with my Plate XVIII. fig. 4; but it is not the *upper* cell which divides again by a parallel wall, as he states, at least in normal cases, but the larger lower one grows and cuts off another cell (*cf.* Vesque's figs. 16 and 17 with our figures and text). Vesque, however, recognizes a difficulty in deciding this; and a possibility exists that in our Plate XVIII. fig. 6 some such process has abnormally occurred.

* Ann. des Sc. Nat. 1878.

In fig. 16 (Vesque) the two nuclei in the lower cell are probably from the first division of the embryo-sac contents; and here he has figured the central row abutting on the embryo-sac (*cf.* Plate XIX. figs. 1 and 2, &c.). He also finds the perpendicular-wall form in the uppermost of the cut-off cells (compare Vesque's figs. 18–20 with our Plate XVIII. figs. 6–8, and Plate XIX. fig. 1), again overlooking the presence of an axial row of cells below the sac. The fate of this upper cell is described in accordance with our views.

But now appears a startling difference in Vesque's account. He finds the lowermost of the cells resulting from division of the embryo-sac mother cell now becoming divided once or twice by cross walls; but on referring to his figs. 19, 21, 23, and 25, it appears probable that he here begins to recognize the presence of the cells of the axial row, a series recognizable in median longitudinal sections throughout (Plate XVIII. fig. 7 and Plate XIX. fig. 1).

In Plate XIX. I have carefully drawn the appearance presented by a section at two planes differing by the thickness of a whole cell: the one (fig. 3) shows the embryo-sac and axial row; the other (fig. 4) shows an *apparent axial row of cells*, as if one cell had become cut up into three by transverse walls. Such appearances are very apt to mislead in the investigation, and are of course due to the series of cells around the central row, one of which, in the figure referred to, is radiating in a plane perpendicular to that of the section.

Before attempting any further explanation of what occurs in *Butomus*, we may describe the facts so far obtained in other ovules.

Embryo-sac &c. of Alisma plantago. (Plate XX.)

The earlier stages in the development of the ovule and embryo-sac offer nothing specially remarkable. So far as my observations go, the description given for *Butomus* covers the main points; and, overlooking some difference in detail due to the relatively smaller number and larger sizes of the cells, we may start our description at the stage when the two integuments have almost ceased growing (Plate XX. fig. 1).

The embryo-sac has driven up the two "cap-cells" in the form of a hyaline cone to the apex of the nucellus; and the cells in the

fore part of the nucellus, *i. e.* the micropyle end, are becoming loose and deliquescent, and at a later stage will be absorbed into the embryo-sac.

These cells are by no means so numerous as in *Butomus*; but their relation to the axial row and periphery is similar: they radiate outwards, especially in young ovules.

The earlier divisions have occurred; a large vacuole separates two masses of protoplasm; and the mass at the micropyle end has formed four nuclei, one of which is commencing to wander into the protoplasm leading to the other end; the other three are becoming arranged into an "egg-apparatus." At the chalazal end of the nucellus are the "antipodal" cells commencing to form. The first bipartition is complete; and whether or not a second occurs, as in *Butomus*, my figures do not show.

That the two nuclei (one from above and one from below) wander towards one another and fuse to form a central nucleus of the embryo-sac, as in *Butomus* and others, is to be fairly inferred from Plate XX. figs. 2 and 3, in both of which the egg-apparatus also is seen in the micropylar end of the sac. In fig. 2 is also a pollen-tube just entering the micropyle, and at the chalazal end a cloudy mass of protoplasm appears to represent "antipodal cells." The unsatisfactory nature of figs. 2 and 3 is due to the use of alkali; for though only the merest trace has been used to clear the preparation (the cells of aquatics become tinged of a deep brown in alcohol); it renders the outlines indistinct, and causes these delicate nuclei to swell up. On the whole, however, I regard the points referred to as satisfactorily established by the sections.

Embryo-sac &c. of Anemone japonica. (Plate XXI.)

In the younger buds, before the peduncle begins to elongate, longitudinal sections of the globoid receptacle &c. show the ovules as papillæ on the ventral base common to carpel and receptacle (Plate XXI. fig. 1). As the carpel grows it carries up this base (Plate XXI. fig. 2), and produces several more ovules, till we get a series of three superposed. Only the lower one appears to attain any prominence, however; and all my remarks apply to it alone.

At first this papilla consists of an axial row with two layers around it (fig. 1), each one cell deep, just as in *Butomus*; the

curvature follows very rapidly, and appears not always to start in the same direction, though later the apex of the ovule is curved directly downwards to the ventral face of the carpel.

On comparing the figures with those of *Butomus*, it will be noted that the cells are smaller and more numerous, and the changes are more rapid in proportion. In Plate XXI. fig. 2 a cell at the apex of the axial row already becomes distinguishable by its sharp outline, bright nucleus, and granular contents; it is the embryo-sac mother cell in the sense already defined.

In Plate XXI. fig. 4 (which is younger than fig. 3) this cell has elongated and contains a very large nucleus; the first divisions to form the integument are seen at the convex part of the epidermis. Only one integument is formed. The subepidermal cells have also commenced to divide, first by walls parallel to the epidermis, then by walls in a vertical plane; and we get a similar series of groups radiating from the axial row to those met with in *Butomus*. The chief difference is in their smaller number. They are pulled out, so to speak, in just the same manner, and probably from the same cause.

In Plate XXI. fig. 3 *a*, which is a magnified drawing of the lowest ovule in the section sketched at fig. 3, we find the embryo-sac mother cell has cut off a cell at its upper two thirds; and in Plate XXI. fig. 5 a second cell appears above by a repetition of this process. The lower cell of the three grows a little, while the two upper ones begin to appear ill-defined, lose their nuclei, and finally (Plate XXI. figs. 6 and 7) their contents become very refractive, and their walls weak and compressed by the cells around. It would appear finally as if these contents were absorbed by the surrounding cells (Plate XXI. fig. 8); for they entirely disappear, with the exception of a thin bright band seen at times as a kind of beak to the embryo-sac.

In Plate XXI. fig. 8 two nuclei have formed in the sac, and appear to be engaged in the first division. I have not followed this further; but in *Ranunculus repens* a normal egg-apparatus, nucleus, and antipodes occur, just as described by Strasburger for *Myosurus*, with which also may be compared this account.

In the more mature ovule also the structure of the nucellus presents features quite similar to that of *Butomus*; and, as there, any argument derived from the mode of division of the cells is equally applicable to the radiating groups which start from the cells sheathing the axial row, and to the axial row itself. And in all

cases this appears to result from laws of growth and cell-division, and cannot be used as a test for determining homologies.

Embryo-sac &c. of Lupinus venustus. (Plate XXI.)

The practical difficulties of obtaining satisfactory preparations of the embryo-sac in this genus (and even in *Pisum* and other Leguminosæ) do not arise merely from the extraordinary number of the small cells, but from their being crammed with granular food-material from the earliest stages, and especially on account of the oblique direction of the axis of the nucellus to that of the carpel, whence longitudinal sections of the latter give oblique sections of the former, in most cases. The main results of many trials are given in the three figures.

In Pl. XXI. fig. 1, obtained from buds when closely packed at the top of the inflorescence, we find an axial row, consisting of one large cell below and three above, which have evidently been cut off by transverse walls. The same process has also occurred in the other subepidermal groups of cells; *i.e.* walls parallel to the epidermis have cut them up into groups, which appear to radiate from the lower part of the axial row to the periphery; and on comparing the figures with those given for *Butomus*, it is evident that the same causes have produced the same effect, and that here, again, an organ increasing in length, breadth, and circumference does so by the cutting-off of cells by walls perpendicular to the lines along which it is growing.

In Pl. XXI. fig. 2, the same relations between the shape of the organ and the arrangement of its cells is observed, and the lower large cell of the axial row has become much longer, as has also a lower cell of one of the lateral rows. If this figure be compared with Strasburger's figures of *Rosa livida**, no small resemblance is noticeable; and one ventures to suggest that, as in *Butomus* so here, the arrangement of the cells depends on general laws of growth, whence it follows that little argument as to the homologies can be derived therefrom.

Pl. XXI. fig. 3, shows just sufficient to demonstrate that the cell-groups above and around the enlarging embryo-sac suffer the same kind of deliquescence and absorption as do those in the fore part of the nucellus in *Butomus*. The exact details of the origin of the embryo-sac from the large cell have not been followed; but it appears probable that the large central cell in Pl. XXI. fig. 2,

* 'Die Angiosperm. u. d. Gymnosp.' pl. iv. figs. 49–50.

becomes directly converted into the embryo-sac, absorbing the cells in the fore part of the nucellus as it does so.

Embyro-sac &c. in Œnothera biennis. (Plate XXII.)

This is another ovule of which it is extremely difficult to get sections sufficiently thin, and at the same time quite median. The cells are remarkably small, and the growth very rapid, whence the fact that the very young ovaries contain ovules far advanced compared with other groups. But the difficulty becomes greater as the ovaries get older; for so brittle and hard are they from the deposit of raphides that a razor's edge is turned at once: add to these facts the abundance of granular material in the cells, and reasons sufficient are given for obtaining very few good preparations from a week's work.

Pl. XXII. fig. 1, shows how very early the one large embryo-sac mother cell is established; and sufficient has been said on the subject to make intelligible the arrangement of the rows of cells above and around this. The embryo-sac mother cell appears to be, as before, an enlarged cell of the axial row; and on tracing its fate we find it (Pl. XXII. fig. 4) cut by a diffluent wall into two equal cells, each of which is again halved by a wall parallel to the first. Whether the embryo-sac results from one or two of these cells I cannot decide.

Embryo-sac &c. of Pyrethrum balsaminatum. (Pls. XXII.–XXIV.)

Having examined *Senecio* as the best-known Composite in this connexion, the accounts given by Strasburger may be referred to as embracing all the points satisfactorily *. But in *Pyrethrum* and *Anthemis* there appears to be an abbreviation of the processes we have hitherto observed.

The cells are small, and the changes somewhat rapid. Fig. 1 gives a fair representation of the ovular papilla, seen in longitudinal section at the base of the ovary of *Pyrethrum*. In Pl. XXII. fig. 6, the embryo-sac mother cell is already conspicuous; and a comparison of the figures suggests that the nucellus arises by the ongrowth of the apical portion only, *i. e.* the part marked off by a line about the level of the base of this cell. In Pl. XXII. fig. 7, the sharp bend of the anatropous ovule is established, as the single integument begins to arise. In the

* 'Die Angiosperm. u. d. Gymnosp.' 1879. But *cf.* also Warming and Vesque, *loc. cit.*

apex of the ovule are about three large cells, growing in length as it grows. Each has a relatively large round nucleus, in which are several bright spherical bodies in a granular matrix *, the rest of the cell being filled with very coarse-grained protoplasm. As the curving proceeds, and the voluminous integument creeps over the nucellus, the latter grows in length (Pl. XXII. figs. 8 & 9) chiefly: it never becomes very large, compared with the whole ovule; and no transverse divisions occur in the three or four cells which, side by side, fill up its interior. On the contrary, these elongate, and are followed by the epidermis, until (Pl. XXII. figs. 10 & 11, and Pl. XXIII. figs. 1–6) the integument meets at a point some distance beyond the apex of the nucellus, leaving a large space, into which, as we shall see, the nucellus-cells grow forwards at a later period. The epidermis of the nucellus now ceases to grow, and soon takes on the peculiar bright appearance of cells undergoing absorption.

Indeed as early as Pl. XXII. figs. 10 & 11 it is plain that one of the large cells of the group in the nucellus has begun to develop at the expense of its neighbours; and a careful comparison of Pl. XXII. figs. 10 & 11, and Pl. XXIII. figs. 1–10 shows that it is not decided for some time which of the group is the fortunate survivor. In Pl. XXIII. figs. 6–10, there are two cells apparently about equally developed: they often appear to twist slightly; and to this cause I attribute the curious appearances seen in Pl. XXIII. figs. 1, 6, & 10. That this is really what takes place is rendered more evident by transverse sections, which are easily obtained by cutting across the capitulum. In Pl. XXIII. fig. 1, two cells have increased at the expense of (?) two others; and one of these is apparently obtaining the mastery (Pl. XXIII. figs. 1–6).

In Pl. XXIII. fig. 5, a central large cell appears to have got the upper hand of its two neighbours; and even the epidermis-cells have now become undistinguishable (Pl. XXIII. figs. 7–10). At a later period this cell (the embryo-sac) grows out, absorbing the epidermal cells as it does so (Pl. XXIII. figs. 11 & 12), until the whole of the space in front is filled up, and the boundary furnished by the integument supplies an apparent epidermis to the sac †. The line across the lower third of the sac in fig. 12

* Such nuclei are common in these Compositæ, and give the sections a peculiar mottled appearance.

† *Cf.* Strasburger's account of *Senecio*, loc. cit.

appears to be the wall of the cell at the base of the nucellus of fig. 6; and the two nuclei and certain longitudinal fine lines in fig. 12 make one inclined to believe that *two* cells still exist side by side (*cf.* Pl. XXIII. fig. 1); but the longitudinal wall between them is being absorbed.

In Pl. XXIV. fig. 2, we have the embryo-sac completed, and its relation to the whole ovule shown; while in Pl. XXIV. fig. 1 is a magnified view of the same sac, where an egg-apparatus is evident at the swollen (micropyle) end, while several dividing (?) nuclei in the sac appear to have some relation to endosperm formation. But I admit my inability to explain this figure and Pl. XXIV. fig. 3 in detail.

To sum up. We have the embryo-sac in *Pyrethrum* resulting from the direct outgrowth of one cell, which sooner or later obtains the upper hand in the struggle between it and its two or three competitors in the nucellus, at the same time the epidermis becoming used up by the developing sac. The process reminds one, indeed, of what occurs in vascular Cryptogams, where one macrospore, or spore-mother-cell, survives at the expense of its neighbours. The details as to the method of forming the complex contents of this embryo-sac I cannot at present describe.

It remains to add, in explanation of Pl. XXIV. fig. 1 &c. that the cells of the integument now closed around the sac become altered, so that those in the layer next the sac take on the appearance of cuboidal cells, and resemble an epidermis, so to speak, while others grow very large, radiating more or less towards the periphery, which consists of less-altered elongated cells. These inner layers also have thickened walls (fig. 1); and this fact, coupled with their large size and radiate arrangement, explains the peculiar appearance in Pl. XXIV. fig. 2.

Embryo-sac &c. of Anthemis tinctoria. (Plate XXIV.)

I have selected one more Composite as an example of still further reduction of the nucellus of the ovule. The figures will explain themselves with the aid of a few remarks; but it may be premised that this short series is not complete; for it is an open question whether, after growing forwards, to fill up the space left by the integument, the large cell in Pl. XXIV. fig. 9, undergoes division. I have failed to observe this, and believe it does not occur.

In Pl. XXIV. figs. 4–6, and Pl. XXV. fig. 1, the curvature of the ovule and the uprising of the integument are shown; one cell, filling up the narrow apex of the ovule, enlarges and keeps its position as sole occupier of the fore part of the nucellus (Pl. XXIV. fig. 6). Its contents are coarsely granular; and its large spherical nucleus has several distinct granules inside. In the epidermal cells one not rarely meets with nuclei presenting the appearance depicted in Pl. XXIV. fig. 7, of which an enlarged drawing is appended: the oval nucleus is traversed by alternate dark and light (granular and pellucid) bands. The one cell referred to, in the apex of the nucellus, grows out, as in *Pyrethrum*, into the space left by the closing-up integument, and destroys the epidermis as before. It appears to become transformed directly into the embryo-sac; but, as already stated, further stages are required.

Embryo-sac &c. of Lobelia syphilitica. (Plate XXV.)

The earlier stages of development of the ovule are so like those of the Composites that we need not dwell upon the description of Pl. XXV. fig. 4. In fig. 5 the embryo-sac mother cell has become divided at its upper third; in fig. 6 a second division has followed upon this; and fig. 7 is a similar stage of a shorter stouter ovule. In the last case the lower cell appears to be enlarging at the expense of the upper ones; and in fig. 8 its contents have become rearranged about two nuclei, between which is a vacuole-like space *traversed by a delicate division-plate*: if this be compared with Strasburger's earlier drawing (fig. 76, pl. ii. 'Ueber Befruchtung' &c.) of *Orchis pallens*, the correspondence of the faint line there passing across the "vacuole" between the two nuclei is evident; in both cases, I believe, we have a distinct cell-wall, and that the difference between this division and those which cut off the two "cap-cells" is only one of degree.

Similar cases appear to occur in his later drawings, *e. g.* in *Anthericum* (pl. vi. fig. 75, 'Die Angiosp. u. Gymnosp.') and *Allium* (same plate, fig. 82) possibly *. In the figure we are considering (Pl. XXV. fig. 8) the two "cap-cells" are seen to persist as refractive streaks on the apex of the embryo-sac, as they are also in Pl. XXV. fig. 9, where the two nuclei of the sac have passed to each end, and are separated by a large vacuole as the sac elongates.

* *Cf.* also Warming, *loc. cit.* pl. viii. fig. 19, the lowest line across the sac.

The importance of the cell-wall (in Pl. XXV. fig. 8) passing across the sac must not be overrated; it is a rare case, and is only insisted on (together with the instances quoted above) because the general character of the successive divisions across the embryo-sac mother cell suggests that they belong to one series—that the mother cell becomes divided, in fact, into *four* superposed cells. But the fact that in most cases no thin wall is recognizable does not prevent our accepting the probability of such a wall existing; it is in a very diffluent state, but is still there, and by its absorption of fluid appears like a vacuole between the nuclei in the sac.

In my next figure (Pl. XXV. fig. 10) the embryo-sac has elongated and filled up the whole space left by the integument as it closed up to form the micropyle; the nucleus at the micropyle end has formed (by alternate division into 2 × 2) an "egg-apparatus"—two "synergidæ" closely packed into the apex, and an "egg-cell" suspended from their bases; while the fourth nucleus is seen travelling down the protoplasm-plates to join its fellow given off from below. In the base of the sac are three "antipodal cells" (*cf.* the account of *Butomus*).

The completion of the sac &c. is shown by figs. 11 and 12 to be quite as in *Butomus*: the two nuclei fuse (fig. 11); and a large bright "nucleus of the embryo-sac" (fig. 12) results. The cells around the base of the sac (in fig. 12 especially), and forming a tube in which the "antipodal cells" lie, are the lower set of epidermal cells of the nucellus (*cf.* Pl. XXV. figs. 9–12), which appear to become quite vigorous again.

As in the Compositæ, the cells of the integument around the sac become arranged with reference to it, and give a characteristic appearance to the mature ovule.

Embryo-sac &c. of Verbascum phlomoides. (Plate XXV.)

One more example of a nucellus reduced to the "axial row" of cells and an epidermis is furnished by such an ovule as is figured at Pl. XXV. figs. 2 & 3. The young ovule (fig. 2) has a large cell terminating the axial series; and the integument grows forwards with it, till, in fig. 3, we have a row of four cells produced by the division of the large granular cell in the apex of fig. 2. The middle wall of the three is the oldest; having divided it into two, each cell then divides again. Whether the embryo-sac arises from one or more cells in fig. 3, I cannot yet state;

but, from analogy with *Senecio*, in which the processes are so far very similar, it is probably from the lower one*.

In concluding these remarks on the drawings accompanying them, the following general statements must be taken for what they are worth, as suggestions rather than any theory. They are not based upon these drawings only, but, besides having reference to the papers quoted, apply to results from *Gymnadenia*, *Senecio*, *Ranunculus*, *Myosurus*, *Anthericum*, *Pisum*, *Agrimonia*, and others.

Whether the nucellus of the ovule consists of few or many cells, a definite relation can be traced between the mode of division of the cells and the shape of the whole ovule. As the latter increases its volume by growth along given lines, this is brought about by division perpendicular to those lines; and (at least for a long time) the same applies to growth along the longitudinal axis: the central series of cells are divided by transverse walls.

In some cases (e. g. *Rosa*, *Lupinus*, *Butomus*, *Œnothera*, &c.) the nucellus consists of radiating groups of cells starting from a common centre about the lower part of the whole mass, which, so far as the method of division is concerned, behave similarly, and might be considered of equal value. But one (*Butomus* &c.,)†, or more (*Rosa* &c.) cells, usually at the base of its group of cells, becomes distinguished at an early date, by the accumulation of protoplasm &c. in its cavity, as the forerunner of the embryo-sac —the "embryo-sac mother cell." In other nucelli these equivalent groups of cells are fewer and more insignificant: in such cases as *Anemone*, for instance, one might imagine the basal cells of the side groups in *Butomus* to have become absorbed into the rudiment of the embryo-sac mother cell; while in Compositæ and others we have the nucleus reduced to the axial row only (*Senecio* &c.) or to a group of three or four cells. In some cases (*Senecio*, *Lobelia*, *Verbascum*, Orchids, &c.) this cell divides as the nucleus elongates; in others (*Pyrethrum*, *Anthemis*) the cell or cells merely elongate for the short distance allowed them.

Whatever be the morphological significance of the mother cell of the embryo-sac, and therefore of the embryo-sac itself, then, we cannot derive it from the manner of division exhibited by its

* *Cf.* also Warming's account of *Verbascum phœniceum*.

† In *Butomus* and *Lupinus*, however, there are indications of this affecting other cells around the central one.

cells; for this depends on a general law of growth applicable to all such organs as the ovule, anther, &c. Hence, while it is true that the mother cells of pollen arise by the tangential division of subepidermal cells in the anther, and the mother cell of the embryo-sac also arises by division in the ovule similarly related to the epidermis &c., it is equally true that other cells in the ovule arise in the same way, and belong to groups of cells which, from this point of view, are homologous with the axial group*.

Nor can we hope to arrive at the nature of the embryo-sac and its neighbours by such criteria as the nature of the cell-walls. As Strasburger has pointed out, the diffluent cell-walls found in pollen mother cells and the division of the embryo-sac mother cell are equally due to the fact that they are soon to be absorbed†. But probably the diffluent partitions in the embryo-sac mother cell are also in part due to the producing cells approaching the limit of division, and no longer having the power to form cellulose envelopes, further division (the formation of the tetrahedral groups of nuclei) being still weaker, so to speak, and no trace of envelope appearing. If this be any argument, may we not have in the separation of the two nuclei to opposite ends of the sac a process differing in degree only from what has already occurred in the formation of the "cap-cells"?; the occasional appearance of a trace of cell-wall as cited above might lend support to such a view.

The above argument applies equally to the formation of the tetrahedral groups of nuclei in the embryo-sac; and, as Sachs has shown, division in planes at right angles to one another is a common (perhaps universal) law of growth. Not only pollen-grains, but embryos, trichomes, &c. show it. Hence, to arrive at any conclusion as to the morphological nature of the embryo-sac and contents, we are driven to other considerations than the modes of division of the cell; for the argument derived from this leads to ambiguity.

The following is suggested. No one denies, probably, that in the Angiospermous ovule we may expect to see the process of reduction of the sexual generation (oophore) carried on somewhat as in Gymnosperms, but to a further extent. This is not asking too much; for we find all the observers admitting it by the fact of their attempting to explain the phenomena at all in terms applied to vascular Cryptogams.

* And this may apply also to other structures, *e. g.* division in a cambium.

† Such divisions are found in the proembryo and other transient structures.

But as we ascend from the lower Cryptogams to the Coniferæ, it is remarkable that the male prothallus always suffers the greatest reduction; and even in the Coniferæ we find a few cells in the pollen-grain, while a relatively large female prothallus (endosperm) forms and bears archegonia (corpuscula &c.) in the embryo-sac. This being so, it is a fair inference that in Angiosperms we ought to find the macrospore, if it exists, producing a relatively larger structure than the microspore (pollen-grain). But it is now well known that two or more nuclei occur in many Angiospermous pollen-grains as first shown by Strasburger *; and if, as is highly probable, we have here a rudiment of division in the microspore only differing in degree from the formation of a prothallus in others, we may expect to find not fewer, and probably more, divisions in the macrospore.

These considerations would urge us to reject the idea that the nuclei in the embryo-sac are homologous with pollen-grains, and are therefore spores, while they might encourage the theory that we have in the repeated bipartition of the nuclei in the embryo-sac a rudimentary prothallus-formation, as Strasburger believes.

And there is another, to my mind, considerable objection against the acceptance of the spore nature of the nuclei. If we regard them as together representing a prothallial structure, we may look upon the "egg-cell" as the equivalent of the "oosphere" of vascular Cryptogams; but if not, we must imagine a process of reduction carried past the point where one might suppose every thing had been removed but the essentials—not only the prothallus reduced to an "oosphere," but even beyond. This appears by no means easy to conceive, and, taken into consideration along with what has been said above, carries some weight.

Let us see what follows by assuming, as a *point de départ*, the homology of the "egg-cell" with the "oosphere" of Cryptogams (the "corpusculum" of Coniferæ). The sister nuclei must then be cells of the prothallus; and, from the position of the "synergidæ," it is perhaps not impossible to regard them as two neck-cells of the archegonium, which have persisted in virtue of their acquired use in fertilization. The fourth nucleus falls into the sac, passing along the protoplasm to fuse with a similar one from below in typical cases. The "antipodal" cells and the ascending nucleus must be regarded as cells of a prothallus; and it depends upon the nature of the vacuole-like space which sepa-

* Strasburger, 'Befruchtung und Zelltheilung;' and Elfving, 'Die Pollenkörner,' &c.

rates the two nuclei which form the tetrahedral groups, whether we regard these groups, with Strasburger, as four cells of an eight-celled prothallus, or as forming a separate four-celled prothallus which remains sterile, &c.

We have already seen the grounds on which rests the possible view that the embryo-sac in *Butomus* and others arises as the result of two cells (products of division of embryo-sac mother cell), having an extremely diffluent wall between them, gradually becoming open to one another as this wall absorbs fluid. If this is so, an attempt to explain in some degree the apparently unique process of conjugation between the two nuclei of the embryo-sac might be suggested if we can assume that so large a cavity as the embryo-sac, destined to perform important functions as the embryo develops, and therefore to live vigorously for some time, would be benefited by a nucleus of extraordinary vitality: such a nucleus might perhaps be supposed to be formed by a process of conjugation between two nuclei derived from slightly different sources.

From this point of view, it must be admitted that the embryo-sac is either a macrospore or a joint structure formed by two apposed macrospores, the success of which has become established in virtue of their favourable position in the centre of the nucleus. How many of the similarly formed cells of the surrounding groups in a large nucleus are to be considered also as incipient macrospores cannot be decided, and probably varies. In *Rosa* and some Crucifers we have apparently several; and in *Pyrethrum* there appear to be four as a rule, while in *Anthemis* we have but one. There is nothing remarkable in the absorption of its neighbouring cells by a successful macrospore or spore mother cell, since in *Pilularia* &c. similar cases exist in the sporangia.

Postscript.

The above had already left my hands when the paper by Vesque in 'Ann. d. Sc. Nat.' Nov. 1879* was shown me: a hurried examination of this enables me to add a short note.

While modifying in many respects the statement of the theory, the author still commits himself to the original hypothesis. "I think that the four nuclei . . . should be considered as a tetrad of spores," he says (p. 263), and, further, remarks:—"I have confirmed this opinion; the morphological problem is solved:

* "Sur le sac embryonnaire."

the embryonic vesicles and antipodes are homologues of spores and pollen-grains; the other cells, of which the nucleus does not become divided, and to which I have given the name of '*anticlines*,' are the homologues of special mother cells arrested in their development."

The *résumé* on p. 262 contains an important modification of the original statement*, and in some respects concedes in favour of Strasburger's views. On p. 291 the author gives it as still his opinion that the conjugation of the nuclei is an *accidental* phenomenon, and in no way sexual.

On p. 311 several important corrections to the original account of *Butomus* are made, and may be compared with his figures and those given with the present essay. In a footnote to the same page Vesque has suggested a similar interpretation of the "first division in the embryo-sac" to that already given by myself, and hinted at in a recent paper†; and the corrections to his previous account of *Orchis* may also be compared with what is said there.

DESCRIPTION OF THE PLATES.

N.B. Except where otherwise stated, the figures are generally drawn from sections in alcohol and glycerine, examined under Zeiss J (imm.) ocs. 2 & 3. The figs. on Pl. XVII. however, and figs. 1–3 on Pl. XVIII. were under Gundlach VII. (immersion).

Plate XVII.

Butomus umbellatus.

Fig. 1. Early rudiment of ovule as an emergence from the placenta. This and the next from fresh specimens treated with alkali.

2. Optical section of older rudiment: an axial row of cells is established.

3 & 4. Actual sections through older ovules, showing first subepidermal divisions to form integument: in fig. 4 the "mother cell of embryo-sac" is evident.

5. More advanced ovule in longitudinal section. The second integument is rising, to follow upon the first; and another series of tangential divisions under the epidermis has made the nucellus broader.

6. Similar stage looked upon from above; the mother cell of embryo-sac is as yet undivided.

7. Slightly older stage, treated with acetic acid &c. to show outlines: the ovule is nearly anatropous; the nucellus contains a long embryo-sac mother cell; the tangential divisions extend forwards; and radial walls have cut up the nucellus into more numerous cells. The two integuments are growing up rapidly over all.

---

* Ann. des Sci. Nat. 1878, p. 276.

† "Embryology of *Gymnadenia*," Quart. Journ. Micros. Sc. Jan. 1880.

Fig. 8. Transverse section of same stage across the nucellus and inner integument only; the regular arrangement of the radial walls is especially evident.

9. Longitudinal section through older ovule, seen from before. Disregarding the axial row and its divisions, the enlarging nucellus-cells are multiplying by further tangential as well as radial divisions: the cells tend to be arranged in rows radiating towards the periphery.

10. Similar section at slightly older stage, treated with warm potash. The contents of cells of the axial row &c. are dissolved away; the radiating groups of subepidermal cells tend towards a common centre below.

Plate XVIII.

Butomus umbellatus (continued)

Fig. 1. Longitudinal section through nearly completed ovule: the loose and diffluent cells in upper part of the nucellus are becoming undistinguishable from the embryo-sac; in lower part of nucellus they are arranged in radiating rows towards the periphery.

2. Transverse section across lower third of similar ovule: *ex.*=outer integument; *in.*=inner ditto; *n*=nucellus.

3. Longitudinal section through nucellus of ovule ready for fertilization, treated with potash and glycerine; the radiating groups of cells abut upon the cells around the axial row, and converge towards a common centre. They are more numerous than in fig. 10, Pl. XVII.; but, as there, a typical group consists of a peripheral or terminal set of four or eight, and a proximal undivided cell or cells abutting on the central series: this is most clear where the group is in longitudinal median section.

4. Longitudinal section through ovule at stage slightly older than fig. 7, Pl. XVII. The embryo-sac mother cell has divided once.

5. Longitudinal section through older ovule: the large cell has again divided; and the foremost of the two "cap-cells" thus cut off now possesses a vertical division-wall.

6. Similar section of older ovule, from before. There appears to be an abnormal number of divisions above.

7. Similar preparation with normal divisions of embryo-sac mother cell: the second division-wall very diffluent.

8. The two cap-cells are separated by oblique walls (abnormal?).

Plate XIX.

Butomus umbellatus (continued).

Fig. 1. The lower larger cell (of those into which the embryo-sac mother cell has divided, and which will become the embryo-sac) is dividing: two nuclei pass to opposite ends; and a vacuole-like space appears between. This "vacuole" may be a very diffluent cell-wall.

2. Similar preparation of older ovule. There are two nuclei in the embryo-sac; and remains of the "cap-cells" form a dark mass at its apex.

Figs. 3 & 4. Longitudinal section of a nucellus of the same stage. Fig. 4 is drawn at a focus a little higher than fig. 3, and the central series of cells are really cells which surround the axial row and embryo-sac.

5 & 6. The embryo-sac commences to absorb the cap-cells and those around.

7. The upper nucleus has divided into four new nuclei, arranged in a tetrahedron. A similar group faintly discernible below.

8. One nucleus from the upper group travels down, and three remain to form an egg-apparatus.

9. The embryo-sac contains an egg-apparatus above, three antipodal cells below, and two nuclei are commencing to fuse in the central part.

10. A slightly later stage showing the egg-cell and two "synergidæ" forming the egg-apparatus: the two nuclei are not yet fused.

11. The two nuclei have blended into one bright spherical "nucleus of the embryo-sac."

Plate XX.

Alisma plantago.

Fig. 1. Ovule and embryo-sac in longitudinal section. The nucleus at the micropyle end of the sac has divided into four, that at antipodal end into two new nuclei. The cells of the nucellus are suffering absorption, but still show arrangement into groups radiating outwards.

2. Ovule at time of fertilization; a pollen-tube in the micropyle. The swollen appearance of egg-apparatus, two approaching nuclei in the sac, and antipodal mass is due to ammonic hydrate used in preparation.

3. Similar section: the large nucleus in centre is from fusion of two. Treated with ammonic hydrate.

4. Fertilized ovule in longitudinal section: showing an embryo at micropyle end of the capacious embryo-sac, which has been cut into, and its walls torn.

Plate XXI.

Anemone japonica.

Fig. 1. Three young ovules, each with its carpellary leaf on the receptacle; a central row of cells is evident.

2. Older rudiment in longitudinal section: the mother cell of embryo-sac already distinguished by its contents.

3. Still older rudiments raised by upgrowth of the carpel: the embryo-sac mother cell of the lower one has divided once.

3 *a*. Enlarged view of the lower ovule of fig. 3.

4. Similar preparation (slightly younger), showing tendency of subepidermal nucellus-cells to radiate outwards.

5. Longitudinal section of nucellus of slightly older ovule: the embryo-sa mother cell has formed two "cap-cells" above.

6 & 7. The two "cap-cells" becoming laterally compressed and destroyed by surrounding cells.

8. Longitudinal section of nucellus of similar ovule; two nuclei in lower large cell. The cap-cells are destroyed, a dark line alone representing them: radiating groups of cells evident.

Lupinus venusta.

Fig. 9. Longitudinal section of young ovule, showing rapid tangential divisions above and around the embryo-sac mother cell.

10. Similar preparation of later stage. Further divisions and general elongation of the nucellus have occurred.

11. Later stage of same. The enlarging embryo-sac is absorbing all the cells around; the nucleus in the centre appears to be the "embryo-sac nucleus."

Plate XXII.

Œnothera biennis.

Fig. 1. Longitudinal section of young ovule. Embryo-sac mother cell surrounded by radiating rows of cells.

2. Similar preparation, from in front.

3. Older ovule in longitudinal section, especially showing the radiate arrangement of the nucellus-cells; as they near the periphery, radial walls cut up the cells formed by tangential division.

4. The divided up embryo-sac mother cell of an older ovule: the middle diffluent wall appeared first; then each half again divided.

Pyrethrum balsaminatum.

5. Longitudinal section of young floret: the ovule-rudiment in the ovary below.

6. Older rudiment in longitudinal section: a subepidermal cell above is already distinguished by its large nucleus &c.

7. More advanced ovule in longitudinal section. The integument arises, and the ovule becomes anatropous. Two cells are distinguishable by size and granular contents: their nuclei contain bright spherical bodies.

8 & 9. Similar preparations of more advanced ovules, showing that about three cells fill up the nucleus and elongate with it for some time.

10 & 11. Similar preparations of more advanced ovule. The integument closes over, and leaves a space above the nucleus; one cell enlarges much. Fig. 11 is the nucellus of fig. 10 more magnified.

Plate XXIII.

Pyrethrum balsaminatum (continued).

Fig. 1. Two of the nucellus-cells appear to enlarge about equally.

2. Transverse section at similar stage. Two large cells nearly fill up the nucellus.

3. One large cell now occupies the whole of the nucellus: the occurrence of more than one nucleus in the protoplasm suggests its origin by absorption of the walls between other cells (*cf.* fig. 1).

4. Similar preparation. One cell appears to be absorbing the rest of the nucellus

Fig. 5. Transverse section of nucellus about the same stage.

6. Similar preparation to fig. 4; but *two* cells appear to be absorbing the rest.

7 & 8. Similar preparation. Fig. 7 is drawn at a higher focus; and its nucleus lay above that of fig. 8. Probably two cells still exist.

9 & 10. Similar preparation. Fig. 9 is drawn at higher focus than fig. 10: there are two cells with very weak walls, absorbing the rest of the nucellus.

11. The cell has absorbed the whole of the nucellus, and is growing out to occupy the space between the integument folds. Remains of nucellus epidermis-cells surround its proximal half.

12. One cell (possibly two) occupies the whole space, and is now closely surrounded by the integuments; it contains at least two nuclei.

Plate XXIV.

Pyrethrum balsaminatum (continued).

Figs. 1 & 2. Ovule about time of fertilization. The integument closely invests the embryo-sac (which appears to have resulted directly from the one dominant cell traced above); and the cells of its inner layer become thick-walled and radiate away from the sac; immediately around the sac, however, they form an epidermis-like layer.

Inside the sac are masses of protoplasm connected by bridles: that at the micropyle end contains a normal egg-apparatus; that in the middle contains four nuclei, apparently produced by division. (Fig. 2 under Hartnack 4.)

Fig. 3. Similar preparation of slightly younger ovule: constituents of egg-apparatus are formed, but the curved lines are not explained. There is a nucleus about the centre, and one or two at antipodal end.

Anthemis tinctoria.

4. Vertical section of very young ovule, one cell at apex already distinguished by its large nucleus.

5. Similar preparation of slightly older ovule. At *a*, peculiar banded nucleus (shown more magnified at fig. 6), such as occurs here and there in rapidly growing tissues.

6. Banded nucleus enlarged, as above mentioned.

7. Slightly older ovule; the one cell at apex is elongating, and the integument commences to arise by subepidermal division.

8. Slightly older ovule. The one cell at apex now occupies the main part of nucellus, and the integument is spreading over the anatropous ovule.

9. The integument closes in as before, and leaves a space between itself and the apex of nucellus: only one cell fills up the interior of the latter.

Plate XXV.

Anthemis tinctoria (continued).

Fig. 1. The one cell now contains several nuclei, and is occupying the whole of the space between the integuments at expense of nucellus-cells.

Verbascum phlomoides.

2. Young ovule, of which integument is first about to rise; one cell occupies the nucellus apex.
3. The one cell referred to in fig. 2 has become divided into four superposed.

Lobelia syphilitica.

Fig. 4. Young ovule, with integument just formed, and one large cell occupying the interior of nucellus.

5. The integument is growing over: the large cell (embryo-sac mother cell) has cut off a cap-cell above.
6. A little later stage. The embryo-sac mother cell is divided into three (or perhaps four) superposed cells; the lower one may belong to the axial row.
7. A little later stage. The upper cap-cell is divided by a vertical wall; the lowest cell is enlarging, and its contents are very granular.
8. The granular cell divides by a very diffluent wall, which swells up and separates the two products: the whole is surmounted by the compressed cap-cells.
9. The cap-cells still discovered on the top of the embryo-sac, in which the two nuclei are separated by a large clear vacuole: the integument-cells form an epidermis-like investing layer.
10. The embryo-sac shortly before completion. An egg-apparatus is forming above; three antipodal cells are found below; and two nuclei are approaching one another in the protoplasm between.
11. Similar preparation. The two nuclei are in contact in the middle part of sac.
12. Ovule ready for fertilization, with a large nucleus of the embryo-sac, antipodal cells below, and an oosphere at base of two synergidæ above.

Note on the Relations between Morphology and Physiology in the Leaves of certain Conifers. By MAXWELL T. MASTERS, M.D., F.R.S., F.L.S.

[Read December 4, 1879.]

THE following remarks have reference to the form, arrangement, direction, internal structure, and function of the leaves of the Silver Firs (*Abies* of Continental, *Picea* of British writers) as contrasted with those of the Spruce Firs (*Picea* of Continental, *Abies* of British writers).

For my present purpose it will not be necessary to enter at full length into details, which can be obtained from easily accessible works.

The outward characteristies are given in all descriptive works treating of Conifers; the physiology of the leaf in general is sketched more or less fully in the text-books. Two special memoirs, however, demand more direct notice at my hands—that of M. C. E. Bertrand, "Anatomie comparée des tiges et des feuilles chez les Gnétacées et les Conifères,"* and that of Prof. M'Nab, entitled "A Revision of the Species of *Abies*"†.

The Pulvini.—In the Spruces the surface of the shoots is marked with very prominent *pulvini*, which have been taken as points of discrimination between species by Zuccarini and others. On a superficial examination, it would seem as if these pulvini were the "decurrent" bases of the leaves—that the sheathing portion of the leaf, in other words, was adherent to or inseparate, for a short distance above its point of origin, from the axis. A closer examination, however, will show that the central fibro-vascular bundle of the leaf passes direct from the axis into the leaf. In a transverse section of a young shoot of *Picea ajanensis* a zone of wood may be seen surrounding the central pith. Around the wood is a thick layer of meristem-cells filled with chlorophyll. Traversing this zone are a number of resin-canals disposed in a ring. The outer portion of this layer of cells develops into a phellogen layer, outside which is a thick corky investment consisting of loose parenchyma whose cells are destitute of chlorophyll, and which forms the mass of the pulvini. Outside this is a layer of hypoderm-cells stained yellow by the addition of potash, and consisting of a single series, except in the recesses

* Annales des Sciences Naturelles, 5th ser. tom. xx. (1874).

† Proceedings of the Royal Irish Academy, 2nd ser. vol. ii. p. 673 (1876).

between the projecting pulvini, where two or three layers of hypoderm-cells may be found. The whole is encircled by thick-walled epidermal cells.

The pulvini, then, are mere outgrowths from the suberous layers of the cortex, and do not form a part of the leaf.

In the Silver Firs the pulvini are scarcely at all developed.

The Leaves.—The leaves of the Spruces are usually more or less four-sided and needle-like, given off on all sides of the shoots, ascending, but not appressed. They are more or less twisted at the base, so as to bring them into the most advantageous position, and to prevent them from encroaching on their neighbours.

In the Silver Firs the leaves on the lateral branches are given off on all sides; but those on the under surface more especially are twisted at the base so as to bring them into nearly the same horizontal plane as the upper ones. The uppermost leaves on the side branches are either parallel in direction with the lower ones (that is, at an angle with the axis of the shoot), or they are placed at right angles with them (that is, parallel in direction with the long axis of the shoot). In the former case the upper leaves are shorter than the lower, so as only partially to overlap them; in the latter case the leaves are of about equal length, and do not overlap or interfere one with another.

In form, the leaves of the Silvers are flattish, with an upper and a lower surface. On the leader shoot of *Abies Nordmanniana* and allied species the leaves vary in position according to age, season of growth, or exposure. Sometimes they are closely appressed against the stem; sometimes they spread horizontally; while at other times, though "ascending," they are not closely appressed to the stem, but are so placed that one edge is directed towards the stem, the surfaces looking laterally. In this latter case, while provision is made for exposure of the surfaces, provision is also made to prevent, as far as practicable, the overshadowing of one leaf by another. In *A. nobilis* the leaves on the leader shoot are appressed to the stem, each leaf ascends obliquely, so that successive leaves form a conspicuous spiral, the tip of one leaf touching the base of the one next above it.

Internal Structure.—But few words will be necessary under this heading, as the publications of Bertrand and M'Nab contain the details requisite for my present purpose. It may suffice to say here that in the angular-leaved Spruces there are usually no palisade-cells. The ground-tissue or parenchyma consists of a

number of ovoid cells more or less loosely aggregated and radiating from the central fibro-vascular bundle. Their walls are thickened, straight or very generally sinuous or undulated. Hypoderm-cells exist beneath the epiderm, especially at the angles of the leaves. Stomates are found on all four sides, but most abundantly on the two lower ones. The resin-canals are usually subepidermal.

In the flat-leaved Silvers there is generally a layer or two of "palisade"-cells beneath the hypoderm of the upper surface. These closely aggregated palisade-cells are filled with chlorophyll, and have their long axes at right angles, or nearly so, to the looser cells of the subjacent parenchyma. The hypoderm is on both surfaces, in one or two layers, but always thickest at the margins of the leaf and over the central fibro-vascular bundle. The palisade-cells are usually confined to the upper surface*.

Resin-Canals.—It forms no part of my present purpose to do more than allude casually to the resin-canals, the differences in the position of which have been used as points whereby to discriminate species by Bertrand and M'Nab. They sometimes vary in the same species according to stage of growth, age, position, &c. I would only note here the unusual position of the canals beneath the *upper* epidermis, or, at least, above the palisade-cells, in *Picea ajanensis*, which may be described as a flattish-leaved Spruce, and the existence of a solitary canal below the midrib in *P. Maximowiczii*, as in the section *Tsuga*. It is interesting also to notice the fact that these resin-canals are often enclosed within a sheath of hard hypoderm-cells, and that they are often placed in grooves and thus protected from pressure by the midrib and other prominent portions of the leaf.

Movements of the Leaves.—Some of the Silver Firs are endowed with a power of motion by means of which the leaves are raised or

* In *Abies* (or *Pseudotsuga*) *nobilis*, a flat-leaved species, M'Nab notes the almost complete absence of palisade-cells—a circumstance which he connects with the presence of stomates on both surfaces of the leaf; and in *A. magnifica*, an angular-leaved species with stomates on all sides, the palisade-cells are also said to be wanting (M'Nab, *l. c.* p. 701, t. 49. figs. 29, 30, *a*). M'Nab's description, however, does not tally with his figures; for in fig. 29 *a* palisade-cells are well developed, as also in fig. 30 (*magnifica*), in which latter numerous stomates are shown on all four sides. Bertrand says that in *Pseudotsuga*, to which section the two species just named belong, "Le tissu fondamental est différencié en parenchyme en palissade et en parenchyme rameux." As there is

lowered. M. J. Chatin (who first placed this fact on record*, though it had been long familiar to growers of these plants) asserts that in the middle of the day the plant (*Abies Nordmanniana*) has a predominant green hue, but when the light is more diffused, as in the evening or early morning, then the plant assumes a milky-white appearance. This appearance is due to the elevation of the glaucous under-surface of the leaves. The movements in question are so obvious during the period of active vegetation that no doubt can exist on the subject. Unlike M. Chatin, however, I have observed that the white hue of *Abies Nordmanniana* is more conspicuous when the branches are exposed to the full rays of the sun. The same remark holds good in the case of *Picea sitchensis* (*Menziesii*), *ajanensis*, and *bicolor*, the leaves of the first of which are more like those of the Spruces than of the Silver Firs †.

The functions of the leaves are, as is well known, threefold :—

α. *Assimilation*, the phenomena attendant upon which are the formation of chlorophyll and other products, and the elimination through the stomates of oxygen. Exposure to light is requisite for this process.

β. *Respiration*, or the appropriation of oxygen and the elimination of carbonic acid-gas, as in animals. For this process exposure to light is not a direct essential.

γ. *Exhalation of Watery Vapour*. This is intensified by heat; but whether light *per se* has any influence upon it is open to question.

The stomates are the principal means by which the gases or the exudations make their exit. The layer of thick-walled epidermal cells, and the still thicker hypoderm-cells beneath, would naturally offer great hindrance either to the entrance or to the exit of gases or of water; hence the stomates might fairly be considered the agents through whose means inhalation and exhalation take place, even had this not been proved by direct experiment.

---

much confusion in the synonymy of these species, it is probable that the discrepancies may be accounted for by this circumstance.

* "Sur les mouvements périodiques des feuilles d'*Abies Nordmanniana*." Abstract in 'Revue Bibliographique' of the Bull. Soc. Bot. France, t. xxiii. p. 103 (1876).

† In connexion with these movements it may be of interest to recall the observations made by me on the revolving nutation of the leader of *Abies Nordmanniana*, see Gard. Chron. ix. 1878, pp. 247 & 826.

If we now correlate these facts, their significance becomes apparent. In the Silvers, where the leaves are so crowded as to overlap each other closely, and where their relatively flat surfaces permit only one face at a time to be exposed to the light, not only are the leaves twisted so as to bring them all into nearly the same plane, but they are in many cases, if not in all, endowed with a power of alternate elevation and depression, so that the lower surface may be exposed to the light. Mutual interference is also obviated by the smaller size of the upper leaves, or by the different direction assumed by the upper and lower leaves respectively.

In Spruce Firs, as a rule, the leaves are less densely packed than in the case of the Silvers, and they are usually more or less 4-sided. There is torsion at the base of the leaf, but, so far as I have seen, little or no motion of elevation and depression*.

Such movements seem not to be required in their case, as the relative position and arrangement, as well as the internal structure, of the leaves are such as to secure a nearly equal amount of exposure on all surfaces; and there would therefore appear to be the less reason for the presence of palisade cells on or just beneath the surface most favourably placed as regards exposure to light. The palisade cells appear to be especially concerned in the process of nutrition and assimilation, for which exposure to direct light is especially advantageous. Where the shape of the leaf permits such an aggregation, the cells in question are formed in that position where they can best fulfil their work. Where the form of the leaf, on the other hand, is such that no one surface is particularly favoured as regards exposure to the light, there is no such marked difference between the form and the functions of the constituent cells. In this connexion it is of interest

* The leaves of *P. sitchensis*, which are angular, have, however, a marked power of movement, but they are destitute of palisade cells. *P. ajanensis*, another Spruce, is remarkable for the movements of its leaves, which, however, are flat and generally, but not always, possess palisade cells; moreover the resin-canals are beneath the upper epidermis, above the palisade cells—a very unusual position. These exceptional cases—and doubtless there are others—do not invalidate the general rule that palisade cells accompany flat leaves which are mobile, and are not found in the more distinctly angular ones, which are nearly if not quite motionless.

to allude to the recent researches of Pringsheim*, which, if confirmed, will greatly modify our views as to the action of chlorophyll. These experiments go to show that the chlorophyll acts as a screen, absorbing some of the luminous rays, and thus diminishing the intensity of the respiratory process, to which it serves as a regulator. In this way the nutritive process and, in consequence, growth are favoured at the expense of the function of respiration†.

It seems clear, then, that the differences in arrangement, relative position, form, organization, torsion, and power of elevation and depression must be in direct relation to the functions which the leaves have to perform. They are so many adaptations to the work that has to be done, and are designed to promote the operations of the leaves as a whole, and to secure to each individual leaf the greatest possible freedom of action consistent with the least amount of encroachment on its neighbours.

But although this is probably correct as a general statement, the details require to be carefully worked out, as at present they must be looked on more as indications of probabilities than as substantiating theories. Thus, while the movements that have been described in *Abies Nordmanniana* and other species are evidently of some functional importance, it does not yet appear what is their precise purpose, whether to increase respiratory activity, to facilitate evaporation through the stomata, or to enhance the functions of the chlorophyll.

* Pringsheim, "Untersuchungen über das Chlorophyll," Monatsb. der kön. Akad. Wiss. Berlin, July 1879.

† Duchartre 'Elemens,' ed. 2, p. 427, notes that in the leaves of [some species of] *Narcissus* and *Dianthus* the palisade cells are on both sides of the leaf. In these plants the leaves ascend, so that the two surfaces are equally exposed to the light, or nearly so, In the Hyacinth there are no palisade cells at all, each surface being here also nearly equally exposed, owing to the direction of the leaves; and the same holds good, as I have lately observed, in the leaves of *Pardanthus chinensis.*

On the Lichens of Dillenius's 'Historia Muscorum,' as illustrated by his Herbarium. By the Rev. JAMES M. CROMBIE, F.L.S. &c.

[Read December 18, 1879.]

THROUGH the courtesy of Professor Lawson, I have recently had the opportunity of examining the lichens in the herbarium of Dillenius, which is preserved in the Botanic Gardens at Oxford. As the synonymy and nomenclature of the earlier writers on Cryptogamic botany were in a great measure taken from his descriptions and figures, it is evidently of the greatest importance to know exactly, from the specimens extant in his herbarium, what species and varieties these descriptions and figures really denote. In so far as the lichens * are concerned, no *systematic* examination of his herbarium has hitherto been made by any lichenist, although individual specimens have been examined by some of our earlier and premicroscopical writers, *e. g.* Lightfoot (*vid.* 'Flora Scotica,' ii. p. 801 &c.) and Turner (*vid.* Linn. Soc. Trans. vii. pp. 109–112). In all other cases (*e. g.* Linnæus, Acharius, Smith in E. B., the indices in the Edinburgh edition of Dill. 'Hist. Musc.' and in Fries, L. E. pp. 464–468, as also in (Krempelhuber's 'Gesch. u. Lit. Lich.' ii. pp. 515–518), the identification of the Dillenian lichens has been simply guess-work; and it certainly says much for the accuracy of the descriptions and figures that in a considerable number of instances, such has proved to be quite correct. As will be seen, however, from what follows, numerous and serious mistakes have been committed which could be corrected only by the due examination of the specimens themselves. In the determination of several critical species, more especially of the genus "*Cladonia*," I am indebted to the valuable assistance of Dr. Nylander, who, in fact, originally suggested to me the importance to lichenological science of a thorough examination of Herb. Dill. The title prefixed to the herbarium, all the specimens in which are duly mounted, is "Specimina Muscorum in Historia Muscorum descriptorum, agglutinata Februario 1744." For its age it is in a remarkably good state of preservation; and the specimens, for the most part, are sufficiently large and characteristic. It is arranged by Dillenius

* The *Musci* and *Hepaticæ* have also recently been examined by Dr. Lind berg; and the results obtained will no doubt be published.

himself according to the order of the Plates and figures in 'Hist. Musc.,' the printed labels attached to most of the specimens having been extracted apparently from the proof-sheets of his work. Unfortunately in several instances there are no specimens present of the species described and figured by him, their places being supplied simply by the corresponding figures. Most of these, however, can be satisfactorily identified from other sources, *e. g.* herbaria of Sherrard and Buddle, to both of which he had access, and which he duly consulted. In what follows I have given the nomenclature, as well as references to the Tables, of 'Hist. Musc.,' which will obviate the necessity of lichenists having to turn to the text, as well as to the figures of Dillenius, which are not always readily accessible except in scientific libraries.

Genus IV. Usnea.

Tab. XI., Dill. Hist. Musc.

F. 1. *Usnea* vulgaris, loris longis implexis, p. 56, = Usnea ceratina, *Ach.* Fertile. The specimen figured is sufficiently characteristic, though in hb. Dill. it is broken up into three portions. By Linnæus and other authors this has been referred to *Usnea plicata*.

F. 2. *Usnea* loris longis dichotomis, extremitatibus tenuioribus, p. 59. Of this there is no specimen, the figure being copied from Michaeli. As conjectured by Acharius, L. U. p. 595, it probably represents an old (atypical) state of *Alectoria sarmentosa*, Ach.

F. 3. *Usnea* loris longis dichotomis, extremitatibus crassioribus, p. 60. The figure here also is copied from Michaeli; and there is no specimen in hb. Dill., where its place seems to be occupied by another species, viz.—

Usnea albo-punctata, Nyl. in MSS. "Subsimilis *U. plicatæ*, sed thallo tereti lævi punctis albis subprominulis punctato, efibrilloso. Apothecia non visa." (*Nyl. in litt.*) This species has also been gathered in the island of Ceylon (*Brodie*).

F. 4. *Usnea* capillacea et nodosa, p. 60, = Usnea articulata (*L.*). The specimen, though sterile, is sufficiently typical.

Tab. XII., Dill. Hist. Musc.

F. 5. *Usnea* mollis, ramis longis compressis, p. 62, = Evernia divaricata, *Ach.* The specimen figured is represented in hb. Dill. by only two or three sterile laciniæ.

F. 6. *Usnea* barbata, loris tenuibus fibrosis, p. 63, = USNEA DASYPOGA (*Ach.*). The specimen is sterile, but presents a few "cephalodia." Correctly identified by Fries, L. E. p. 18; but by most others referred to the *Lichen barbatus* (L.).

F. 7. *Usnea* jubata nigricans, p. 64, = ALECTORIA JUBATA (PROLIXA), *Ach.* Though sterile and sparingly sorediate, the specimen is quite typical.

Tab. XIII., Dill. Hist. Musc.

F. 8. *Usnea* lanæ nigræ instar, saxis adhærens, p. 66, = ALECTORIA BICOLOR (*Ehrh.*). There is only a small sterile specimen in hb. Dill., of which the figure given is by no means good, which has no doubt led to its being erroneously supposed by authors to represent *Parmelia lanata* (L.).

F. 9. *Usnea* cæspitosa exilis capillacea atra, p. 66, = PARMELIA LANATA (*L.*). Only a few sterile fragments are present. The figure is not at all characteristic, and certainly bears a kind of resemblance to *Ephebe pubescens*, for which it has been mistaken. This latter, however, is not a Dillenian species.

F. 10. *Usnea* rigida, horsum vorsum extensa, p. 66, = ALECTORIA JUBATA, var. CHALYBEIFORMIS (*L.*). Infertile. Only a few filaments of the specimen are figured.

[F. 11. *Usnea* nigra, setæ equinæ facie, parum ramosa, p. 67. A = THAMNOMYCES PATAGONICUS, *Cromb.* As suggested by Acharius in L. U. p. 589, this is evidently a distinct species. B = THAMNOMYCES SETIFORMIS (*Roth*). Fertile. Both are Fungi.]

F. 12. *Usnea* vulgatissima tenuior et brevior, sine orbiculis, p. 67. A = USNEA HIRTA (*L.*). Infertile. B = U. HIRTA f. MINOR. Sterile. This state, however, occurs fertile in Britain. C = U. HIRTA f. SOREDIATA. Sterile. D = U. FLORIDA (*L.*). Atypical and stunted old sorediate states, of which there are two specimens in hb. Dill. This has not been distinguished by authors from *U. hirta*.

F. 13. *Usnea* vulgatissima tenuior et brevior cum orbiculis, p. 69. A = USNEA FLORIDA (*L.*). Typical and fertile. B, C, D = U. STRIGOSA, *Ach.* Different states, of which there are several poor specimens, some of them scarcely distinguishable from states of *U. florida*, to which all the figures have been referred.

F. 14. *Usnea* ceratoides candicans, glabra et odorata, p. 71, = RAMALINA ARABUM (*Ach.*). Infertile. The specimen figured is

sufficiently characteristic, and was rightly referred by Acharius, L. U. p. 596, and by subsequent authors to this species.

F. 15. *Usnea* dichotoma compressa, segmentis capillaceis teretibus, p. 72,=CHLOREA CANARIENSIS (*Ach.*). Sterile, and with pale coloured thallus. This was strangely referred by Fries in 'Index Dill.' to a species which he calls *Evernia lacunosa.*

F. 16. *Usnea* capillacea citrina, fruticuli specie, p. 73,=PHYSCIA FLAVICANS (*Sw.*). Of this there are three specimens, typical, but sterile. Erroneously referred by Linnæus to his *Lichen vulpinus*, in which he was followed by Hudson and the older British authors.

F. 17. *Lichen* pulmonarius minimus subluteus, receptaculis florum coronatus, mali aurantii coloris, Mich. p. 74,=PHYSCIA CHRYSOPHTHALMA (*L.*). There is no specimen in hb. Dill.; but the figure, copied from Michaeli, leaves no doubt as to the identity.

Genus V. CORALLOIDES.

Order I.

Fungiform species, neither tubulose nor branched.

Tab. XIV., Dill. Hist. Musc.

F. 1. *Coralloides* fungiforme carneum, basi leprosa, p. 76,= BRÆOMYCES ROSEUS (*Pers.*). There are several specimens of this, all of which are well fruited, though with paler apothecia.

F. 2. *Coralloides* fungiforme fuscum, basi foliacea, p. 77,= CLADONIA CARIOSA (*Ach.*). Typical, but very fragmentary. Erroneously, and notwithstanding the description given, supposed to denote *Bæomyces rufus*, DC. Along with it in hb. Dill. is a fragment of *Cladonia delicata* (Ehrh.); but, judging from the diagnosis and the figure, *C. cariosa* is the species which Dillenius had in view.

F. 3. *Coralloides* fungiforme arboreum nigrum vix crustosum, p. 78. A=CALICIUM TRACHELINUM, *Ach.* Only a small fragmentary specimen. Rightly identified by Fries, L. E. p. 390, and referred doubtfully by Turner and Borrer, L. Br. p. 151, to *C. debile* (Sm.)=*C. subtile*, Pers. B=CALICIUM HYPERELLUM, *Ach.* Also fragmentary, with only two or three apothecia visible. Referred by Fries to *C. chrysocephalum*, and by Turner and Borrer to *C. sphærocephalum* (Web.).

F. 4. *Coralloides* fungiforme saxatile pallide fuscum, p. 78, = Bæomyces rufus f. rupestris (*Pers.*, *Ach.*). A fragment in which the apothecia are small, sessile, and conglomerated. Rightly identified by Acharius in Meth. p. 321, and by most authors referred to *B. rufus.*

[F. 5. *Coralloides* fungiforme ex ungula equina, livide rubescens, p. 78, = Onygena equina, *Pers.* Not a lichen, but a fungus; though regarded by Hudson (Fl. Angl. ii. p. 528) and others of the older lichenists as a variety of *Bæomyces rufus.*]

F. 6. *Coralloides* scyphiforme, tuberculis fuscis, p. 79. A, B = Cladonia fimbriata, *Hffm.*, f. simplex. Sterile. Various states occur in hb. Dill., but none of them referable to *Cl. pyxidata*, as has generally been supposed, though B is referred by Acharius, in Syn. p. 267, to his *Cenomyce pleurota.* Along with B there are two sterile fragments of *Cl. sobolifera*, Del. C, I, K, L, M = Cladonia pyxidata f. prolifera. Various states, and generally correctly identified. D, E, F, G, H = Cladonia verticillata, *Hffm.* Different states, spermogoniiferous, and with young apothecia.

F. 7. *Coralloides* scyphiforme, tuberculis coccineis, p. 82. A, B, C, D = Cladonia coccifera (*L.*). Sterile. E, F = the same fertile, but with decolorate apothecia. In hb. Dill. all of these, with a single exception, occur in the same specimen, from which the fragments figured were no doubt selected. G, H, I = Cl. coccifera f. extensa (*Hffm.*). Fertile. Rightly referred to this by Acharius in Meth. p. 332; but not distinguished by other lichenists. K, L, M = Cl. coccifera, var. asotea (*Ach.*). Fertile and characteristic. Distinguished by Acharius in L. U. p. 538. Along with these there is also a fine specimen of *Cl. coccifera* f. *epiphylla*, Fr., which has neither been figured nor described by Dillenius.

F. 8. *Coralloides* scyphiforme gracile, marginibus serratis, p. 84. A, B = Cladonia fimbriata, *Hffm.*, f. simplex. Fertile. C = f. prolifera. Sterile; but is not present in hb. Dill. Rightly identified, except by Fries, who refers C to *Cl. verticillata.*

F. 9. *Coralloides* scyphiforme, marginibus radiatis et foliatis, p. 85. A, B = Cladonia sobolifera, *Del.* Fertile. The spemen is broken up into fragments. Erroneously supposed by Linnæus to represent his *Lichen cornucopioides*, in which he has been followed by most other authors.

F. 10. *Coralloides* scyphis gracilibus tubiformibus, Pedicularis folio, p. 85. A=CLADONIA FIMBRIATA f. TUBÆFORMIS, *Hffm.*; "*megaphylla*," Coem. Sterile. Not distinguished, except by Hudson, Fl. Angl. ii. p. 552, s. n. *Lichen filiformis*, from the following. B=CL. MACILENTA f. FILIFORMIS (*Sm.*). Of this there is no specimen in hb. Dill.; but as he describes the plant as having the apothecia "exilia, coccinea," it is no doubt referable to this form; and has been correctly identified by Fries.

F. 11. *Coralloides* scyphis humilibus, intus fuscis, p. 86, = CLADONIA FIMBRIATA f. EXILIS (*Ach.*). The specimen figured is broken up into fragments, upon which only two or three almost sessile apothecia are visible. Rightly distinguished by Acharius in Meth. p. 338, s. n. *Bæomyces pyxidatus*, *β exilis*, the name *pygmæa* given it by Fries in Index Dill. being consequently superfluous.

F. 12. *Coralloides* scyphiforme, foliis alcicorniformibus cartilaginosis, p. 87. A=CLADONIA ALCICORNIS (*Lghft.*). The specimen in hb. Dill. is infertile, the one figured with apothecia having been taken from some other source. B=CL. CERVICORNIS (*Ach.*). Two specimens, infertile. Hitherto not rightly identified, having been included by Lightfoot under the preceding, and referred by Acharius in Meth. p. 350, to his var. *cladomorpha*. C=CETRARIA DELISEI *FASTIGIATA, *Del.* Sterile. This has not previously been determined. D=CLADONIA SQUAMOSA f. CUCULLATA (*Del.*). Infertile. Now for the first time identified.

F. 13. *Coralloides* scyphiforme serratum elatius, caulibus gracilibus glabris, p. 88. A, B=CLADONIA GRACILIS (HYBRIDA), *Ach.* Fertile. C, D=CL. GRACILIS f. CHORDALIS, *Flk.* Sterile. Both of these have for the most part been rightly determined by authors. E=CL. CRISPATA f. CETRARIÆFORMIS (*Del.*) (=*Cl. furcata* f. *subcrispata*, Coem. Clad. Belg. n. 200). Sterile. Referred by Acharius to his var. *cladonioides* of *Cladina amaurocræa*, with which it has nothing in common.

Series II. Species with imperfect scyphi.

Tab. XV., Dill. Hist. Musc.

F. 14. *Coralloides* vix ramosum, scyphis obscuris, p. 90. A=CLADONIA MACILENTA, *Hffm.* Fertile. The specimen figured has the apothecia denigrate in hb. Dill. This is the *Lichen cornutus*

of Hudson and the older British lichenists, but not of Linnæus, Acharius, and modern authors. B, C=Cl. macilenta f. clavata (*Ach.*). Sterile. Of B, the specimen figured is not in hb. Dill., where its place is represented by a single sterile podetium of *Cl. gracilis* **cornuta* (L.). D, E=Cl. subcornuta, *Nyl.* Sterile. Erroneously referred by Fries to *Thamnolia vermicularis* (Sw.). E=Cl. bellidiflora (*Ach.*). Spermogoniiferous. Also erroneously supposed by Fries to represent *Cl. decortica*, Flk.

F. 15. *Coralloides* scyphiforme, ossis femoris facie, p. 91. A=Cladonia bellidiflora (*Ach.*). Fertile; but with denigrate apothecia. B=f. vestita (*Ach.*). Fertile; but with decolorate (brownish) apothecia. This latter was correctly identified by Acharius in L. U. p. 541, but, very singularly, was referred by Fries in Index Dill. to *Cl. cornuta.* Neither of the specimens figured are in hb. Dill., having been copied by him from those in hb. Sherrard.

F. 16. *Coralloides* scyphiforme cornutum, p. 92. A=Cladonia fimbriata f. denticulata, *Flk.* Of this there are several sterile podetia. Not distinguished by authors from the two following. B, D, E=Cl. fimbriata * nemoxyna (*Ach.*), Coem. Cl. Belg. n. 77. Different states, more or less evolute, of which D is fertile. C, F, G=Cl. fimbriata f. radiata (*Ach.*), Coem. Cl. Belg. n. 58. Typical, but sterile. To this last all the above, with the exception of C, are referred by Acharius in Syn. p. 255.

F. 17. *Coralloides* cornucopioides incanum, scyphis cristatis, p. 94=Cladonia macilenta f. polydactyla, *Flk.* Sterile, and somewhat atypical. This is *Lichen ventricosus* of Hudson, Fl. Angl. p. 457, and is doubtfully referred by Acharius in Syn. p. 273, to *Cenomyce sparassa*=*Cladonia squamosa,* Hffm. By Fries A is rightly identified, but B, C are erroneously regarded as varieties of *Cl. carneola.*

F. 18. *Coralloides* crassius subincanum, calicibus dentatis, p. 95. A=Cladonia macilenta, *Hffm.* Atypical. A larger state, approaching to f. *clavata*, Ach., of which there are two sterile specimens. Hitherto erroneously supposed to represent *Cladonia deformis,* Hffm. Of this there is no specimen in hb. Dill., though I think I have seen something similar in one of the older herbaria.

F. 19. *Coralloides* ramulosum, tuberculis coccineis, p. 96. A, B, C=Cladonia bacillaris (*Ach.*). Fertile, but fragmentary

specimens, of which the figs. of A and B are by no means good; whence Acharius, in Syn. p. 268, refers these to his *Cenomyce digitata*, var. *monstrosa*. Along with these is a small specimen, neither figured nor described by Dillenius, which Nylander calls *Cladonia pityrea* f. *scabridula*, Nyl. "Forma divaricatula, accedens versus *Cl. corymbosulum*, Nyl. in C. Wright, L. Cub. ser. 2. n. 93 (Flora, 1876, p. 560)."—*Nyl. in litt.*

F. 20. *Coralloides* parum ramosum, tuberculis fuscis, p. 97,= CLADONIA PITYREA, *Flk.* Fertile and quite typical, though the specimen figured is broken up into fragments. Erroneously referred by authors to *Cl. degenerans*, var. *anomæa* (Ach.). Along with this in hb. Dill. is a fertile specimen of *Cladonia gracilis* f. *chordalis*, Flk., marked "cauliculis glabris."

Order III.

Branched fruticulose species, acute at the summits, multifariously divided.

Series I. Tubulose species.

Tab. XVI., Dill. Hist. Musc.

F. 21. *Coralloides* perforatum majus, molle et crassum, p. 98,= CLADINA UNCIALIS (*L.*), var. ADUNCA (*Ach.*). Sterile. A is very sparingly spermogoniiferous.

F. 22. *Coralloides* perforatum minus, molle et tenue, p. 99. A, C, D=CLADINA UNCIALIS (*L.*). Sterile, of which A is a smaller state. B=CLADONIA CRISPATA (*Ach.*). Sterile. The small specimen in hb. Dill. consists of only a very few podetia. Not rightly distinguished by lichenists from the preceding and the following. E, F, G. Of these there are no specimens; but they apparently represent small states of f. *obtusata*, Ach. H= CLADONIA SUBSQUAMOSA, *Nyl.* Sterile. Not hitherto correctly identified, and quoted only by Acharius in L. U. p. 559, as var. *attenuata* of *Cl. uncialis*.

F. 23. *Coralloides* pulchrum, geniculis acetabuliformibus crispifoliosis, p. 100,=CLADONIA CRISPATA f. VENTRICOSA (*Del.*). Sterile. Of this there are two fine specimens, sparingly spermogoniiferous. Erroneously referred by Fries to *Cl. verticillaris*, Radd., and by Krempelhuber to *Cl. Dilleniana*, Flk.

F. 24. *Coralloides* imperforatum, corniculis brevissimis crispis

p. 100, = CLADINA UNCIALIS f. OBTUSATA, *Ach.* Typical, but sterile. Three specimens are present in hb. Dill. Doubtfully referred by Fries to *Cladia aggregata* (Sw.), in which he is followed by Krempelhuber.

F. 25. *Coralloides* sparsum, caulibus tortuosis et spinosis, p. 101, = CLADONIA FURCATA, var. RACEMOSA f. SPINOSA (*Huds.*). Fertile. Of the specimen figured there are only a few podetia present.

F. 26. *Coralloides* corniculis longioribus et rarioribus, p. 102, = CLADONIA FURCATA (SUBULATA, *L.*), *Hffm.* Fertile. The figures do not appear to have been made from any of the three specimens in hb. Dill.

F. 27. *Coralloides* corniculis brevioribus et crebrioribus, p. 104. A, B = CLADONIA FURCATA, *Hffm.* Sterile. The specimens have no basal leaflets as in the figures; and A is a young atypical state. C = CL. FURCATA, var. RACEMOSA, *Flk.* Fertile. D = CL. FURCATA, var. RECURVA (*Hffm.*). Sterile. E = CL. ACUMINATA (*Ach.*), *Norrl.* An old, sterile, fragmentary specimen (atypical). The figure is by no means characteristic; so that it has not hitherto been determined.

F. 28. *Coralloides* minimum fragile, Madreporæ instar nascens, p. 107, = PYCNOTHELIA PAPILLARIA (*Ehrh.*). Sterile. The specimen figured is in hb. Dill. broken up into two portions.

F. 29. *Coralloides* montanum fruticuli specie, ubique candicans, p. 107. A, B = CLADINA RANGIFERINA (*L.*), of which B is fertile. C, D = young states of the same. E, F = CL. SYLVATICA f. ALPESTRIS (*L.*). Sterile.

F. 30. *Coralloides* fruticuli specie candicans, corniculis rufescentibus, p. 110. A = * CLADONIA PUNGENS, *Flk.* A young sterile state. B = CLADINA SYLVATICA (*Hffm.*). Typical and fertile. C, D = * CLADONIA PUNGENS f. FOLIACEA, *Flk.*, of which D is fertile. This last was rightly identified by Fries in Index Dill.

Series II. Fruticulose species, solid or not tubulose.

Tab. XVII., Dill. Hist. Musc.

F. 31. *Coralloides* fruticuli specie fuscum, spinosum, p. 112. A = CETRARIA ACULEATA, var. HISPIDA (*Lghft.*). B = C. ACULEATA f. ACANTHELLA (*Ach.*). There is, however, along with this latter

a specimen of *C. aculeata* sufficiently typical. All the specimens are sterile.

F. 32. *Coralloides* tenuissimum nigricans, mundi muliebris instar textum, p. 113,=PARMELIA LANATA, var. RETICULATA (*Wulf.*). Aptly compared by Dillenius to "black lace." The specimen is small and infertile. Referred by Acharius, in Meth. p. 304, to his *Cornicularia lanata*, and, very strangely, by Fries in Index Dill. to *Racodium rupestre* (Pers.).

F. 33. *Coralloides* crispum et botryforme alpinum, p. 114,= STEREOCAULON DENUDATUM, *Flk.* The specimen figured is broken up into three portions, one of which is sparingly fertile, though "cephalodia" and also *Sirosiphon saxicola*, Näg., are present in all. Rightly identified by Fries.

F. 34. *Coralloides* alpinum, Corallinæ minoris facie, p. 116. A, B=SPHÆROPHORON FRAGILE (*L.*). Sterile. Hitherto not determined by authors. C=S. COMPRESSUM, *Ach.* Typical and fertile.

F. 35. *Coralloides* cupressiforme, capitulis globosis, p. 117,= SPHÆROPHORON CORALLOIDES, *Pers.* A = young state. B = mature state. C=fertile state.

F. 36. *Coralloides* Coralii minimi facie, p. 118,=LECANORA FRUTICULOSA, *Eversm.* In the small fragment in hb. Dill., from the Ural mountains, the apothecia are immature, without any spores; but judging from its other characters, it seems entirely to belong to this species. Erroneously referred by Fries, the only author who has sought to identify it, to *Siphula ceratites.*

F. 37. *Coralloides* corniculatum, Fuci tenuioris facie, p. 118,= PARMELIA TRISTIS (*Web.*). Fertile. The specimen figured is broken up into two portions.

F. 38. *Coralloides* fasciculare verrucosum et veluti siliquosum, p. 119,=RAMALINA CUSPIDATA f. CORNUATA (*Ach.*), of which A (=LICHEN SILIQUOSUS, *Huds.*) is spermogoniiferous and B is fertile. Generally referred by later authors to *R. scopulorum* (Retz.).

F. 39. *Coralloides* fasciculare tinctorium, Fuci teretis facie, p. 120,=ROCCELLA TINCTORIA, *DC.* The four specimens figured are present in hb. Dill. Of these, A=young state; B=mature state, with soredia; C=mature and esorediate state; D=fertile state.

Genus VI. Lichenoides.

Order I. Aphyllous species, merely crustaceous.

Series I. Tuberculose species.

Tab. XVIII., Dill. Hist. Musc.

F. 1. *Lichenoides* crusta tenuissima, peregrinis velut litteris inscripta, p. 125. A = Opegrapha varia f. signata, *Ach.* The specimen is but poorly represented by the figure. B = Graphis scripta, *Ach.* A state referable to f. *divaricata*, Leight., rather than to any other form. The figure here is also bad. Both have been referred by authors to *Graphis scripta*.

[F. 2. *Lichenoides* punctatum et rugosum nigrum, p. 125, = Dichæna rugosa, *Fr.* Not a lichen, as supposed by the earlier writers, but a fungus.]

F. 3. *Lichenoides* leprosum, crusta cinereo-virescente, tuberculis nigerrimis, p. 126, = Lecidea parasema, *Ach.*, *Nyl.* The specimen figured, of which this forms part, is broken up into fragments, some of which are referable to var. *elæochroma*, Ach. There is also along with these a specimen of *Lecidea disciformis*, Fr., with young apothecia. The former is the *Lichen sanguinarius* of Hudson and the older British lichenists.

F. 4. *Lichenoides* leprosum, tuberculis fuscis et ferrugineis, p. 126, = Lecanora ferruginea (*Huds.*), pro p., and Anthonia cinnabarina, var. kermesina (*Schær.*). The specimen, of which the figure is very poor, is in hb. Dill. broken up into two portions, each of which contains one of the above species. Of these the former has been correctly determined, except by Fries, who refers it to *Biatora vernalis*; and the identity of the latter was first indicated by Turner in Trans. Linn. Soc.

F. 5. *Lichenoides* nigro-flavum, tabulæ geographicæ instar pictum, p. 126, = Lecidea geographica (*L.*). A good characteristic specimen.

[F. 6. *Lichenoides* tuberculosum amœne purpureum, p. 127, = "Tubercularia vulgaris, *Tode*," which is *Nectria cinnabarina*, Fr. "Conidiifera." Not a lichen, but a fungus.]

[F. 7. *Lichenoides* tuberculosum compressum nigrum, lignis putridis adnascens, p. 127, = Hypoxylon fuscum (*Fr.*). Also not a lichen, but a fungus. There is present also another fungus, viz., *Diatrype bullata* (Fr.).]

F. 8. *Lichenoides* tartareum tinctorium candidum, tuberculis atris, p. 128,=LECIDEA MELINA (*Kphb.*), *Nyl.* Saxicole. The specimen is in hb. Dill. broken up into various fragments. Hitherto erroneously referred to various species of *Lecanora* and *Lecidea.*

Series II. Scutellate species.

F. 9. *Lichenoides* verrucosum et rugosum, cinereum, glabrum, p. 128,=PERTUSARIA COMMUNIS, *DC.*, pro p., and P. FALLAX (*Pers.*), pro p. Both species are present in hb. Dill.; and, as observed by Turner and Borrer, L. Br. p. 189, the figure appears to partake of both, though the latter has not been distinguished by other authors.

F. 10. *Lichenoides* leprosum tinctorium, scutellis lapidum cancri figura, p. 130,=LECANORA PARELLA (*L.*). The specimen is broken up into very small fragments.

F. 11. *Lichenoides* candidum et farinaceum, scutellis fere planis, p. 131. A=“LEPRARIA ALBA,” as pointed out in T. & B. L. Br. p. 63, note. B=PERTUSARIA GLOBULIFERA f. DISCOIDEA (*Sm.*). C=P. AMARA (*Ach.*). Sterile. This is the *Lichen fagineus*, pro p., of the older authors. D=URCEOLARIA SCRUPOSA, *Ach.* A very old muricole state. Along with these, as observed in L. Br. *l. c.*, there are fragments of *Lecanora albella*, Ach., and a sterile sorediate specimen of some *Pertusaria* (from the island of Providence) referred by T. & B. to *Phlyctis agelæa.*

F. 12. *Lichenoides* tartareum farinaceum, scutellarum umbone fusco, p. 132,=LECANORA TARTAREA (*L.*). A state with verrucose pulverulent thallus and decolorate apothecia, of which there is only a mere fragment in hb. Dill. Referred by Fries to his *Parmelia sordida*=*Lecanora glaucoma*, Ach.

F. 13. *Lichenoides* crustaceum et leprosum, acetabulis majoribus luteis, limbis argenteis, p. 132,=LECANORA TARTAREA (*L.*). Typical. Of this there are two good specimens, well fruited with crowded apothecia.

F. 14. *Lichenoides* tartareum lividum, scutellis rufis, margine exili, p. 133,=LECANORA VENTOSA (*L.*). Of this there are also fine typical specimens in hb. Dill.

F. 15. *Lichenoides* crustaceum et leprosum, scutellis nigricantibus majoribus et minoribus, p. 133. A=LECANORA ATRA (*Huds.*). B = URCEOLARIA SCRUPOSA *Ach.* First identified by Turner

in Trans. Linn. Soc. The specimens of both in hb. Dill. are sufficiently typical.

F. 16. *Lichenoides* crustaceum et leprosum, scutellis subfuscis, p. 134. A, B=LECANORA SUBFUSCA (*L.*). The specimens are fairly characteristic, the thalline margin in A being entire and in B somewhat crenulated. There are also in hb. Dill. a specimen of *L. subfusca*, var. *coilocarpa*, Ach. (saxicole), and a fragment of *Lecanora ferruginea* (Huds.), referred to in the text as having the colour of the apothecia "rufus vel ferrugineus."

F. 17. *Lichenoides* crustosum, orbiculare, incanum, p. 135. A =LECIDEA CANESCENS (*Dcks.*). Sterile, of which there are three specimens (muricole). Rightly identified by Dickson and subsequent authors. B=LECANORA GALACTINA, *Ach.*, as indicated by T. & B. in L. Br. p. 65, although referred by Fries to *Parmelia circinata*. The specimen is broken up into a number of mere fragments.

F. 18. *Lichenoides* crustosum, orbiculis et scutellis flavis, p. 136. A, C=PLACODIUM MURORUM (*Hffm.*). There are several specimens in hb. Dill., some of which are fertile. Referred by Hudson and others to *Lichen candelarius*, but rightly determined by Acharius in L. U. p. 433. B=LECANORA CITRINA, *Ach.* Sufficiently typical, and fertile. Along with this there is also a sterile specimen of *Lecanora candelaria*, Ach.

Order II. Foliose species.

Series I. Gelatinous species, tuberculose and scutellate.

Tab. XIX., Dill. Hist. Musc.

[F. 19. *Lichenoides* maritimum gelatinosum crassum, intestinorum gyros referens, p. 137,=RIVULARIA PLICATA, *Carmich.*, *Harv. in Hook. Br. Fl.* ii. p. 396. Erroneously supposed by Dickson to be a lichen, and as such named by him *Lichen corrugatus* in Crypt. Fasc. iv. p. 26, and so referred by other authors to the genus *Collema.*]

F. 20. *Lichenoides* gelatinosum membranaceum tenue nigricans, p. 138,=COLLEMA NIGRESCENS (*Huds.*). Fertile. Along with it is also a sterile fragment of *C. flaccidum.*

[F. 21. *Lichenoides* gelatinosum tenue reticulatum, p. 138. Although doubtfully referred to *Collema* in Ach. Meth. p. 247, s. n. *Parmelia sagenalis*, and to *Leptogium* in Kphb. Gesch. Litt.

Lich. ii. p. 517, s. n. *L. reticulatum*, Mnt., the specimen in hb. Dill. is certainly not a lichen, but something of an Algological nature; or rather, according to Nylander *in litt.*, it may be a *Spongillus* overspread by some small protococcoid Alga.]

F. 22. *Lichenoides* gelatinosum, lobis crassioribus fusco-viridibus, p. 138,=COLLEMA FURVUM, *Ach.* The specimen figured is broken up into small fragments, of which only one or two are very sparingly fertile. Erroneously referred by Borrer in E. B. S. to his *C. dermatinum.*

F. 23. *Lichenoides* gelatinosum atro-virens crispum et rugosum, p. 139,=COLLEMA CHEILEUM, *Ach.* Fertile, but fragmentary. This is the *Lichen crispus* of Hudson and our older authors, but not of Acharius.

F. 24. *Lichenoides* gelatinosum atro-virens, auriculatum et granosum, p. 140. A=COLLEMA FURVUM, *Ach.* Of this there are only two sterile and somewhat atypical fragments, which at first I was inclined to refer to *C. auriculatum*, Hffm. It is the *Lichen granulatus* of our earlier lichenists. B, C=LEPTOGIUM PLICATILE (*Ach.*). Fragmentary and sterile. Hitherto not determined.

F. 25. *Lichenoides* gelatinosum fuscum, Jacobææ maritimæ divisura, p. 140,=COLLEMA MELÆNUM f. MARGINALE (*Huds.*). Fertile. Small and fragmentary specimens.

F. 26. *Lichenoides* gelatinosum, foliis imbricatis et cristatis, p. 140. A, B, D=COLLEMA TENAX, *Ach.* Fertile. The specimen is broken up into fragments. It is the *Lichen cristatus* of our older lichenists. C=COLLEMA PULPOSUM (*Bernh.*). Fertile but fragmentary. Along with these are also two fragments of *Collema cheileum*, Ach.

F. 27. *Lichenoides* gelatinosum palmatum, tuberculis conglomeratis, p. 141. A, B=COLLEMA FASCICULARE (*L.*). Fertile. Always correctly identified. Along with fragments of this species there are also others of *Collema crispum*, var. *ceramoides*, Borr. Sterile.

F. 28. *Lichenoides* gelatinosum, foliis angustioribus tenuiformibus, p. 142,=LEPTOGIUM FLUVIATILE (*Huds.*). Infertile. Of this there are four fragmentary specimens, which were no doubt gathered by Dillenius himself in the streams of Snowdon.

F. 29. *Lichenoides* gelatinosum, foliis latioribus tenuiformibus, p. 142. A, B=COLLEMA FURVUM f. TUNÆFORME (*Ach.*). Sterile. C. Of this unfortunately there is no specimen in hb. Dill. There are, however, two fragments of another *Collema* which may

be *C. tenax*, Ach.; but as both are sterile and but little evolute, this is uncertain.

F. 30. *Lichenoides* pellucidum fuscum corniculatum, p. 143, = LEPTOGIUM PALMATUM (*Huds.*). Fertile. The specimen is quite typical, though only very young apothecia are present.

F. 31. *Lichenoides* pellucidum, Endiviæ foliis tenuibus crispis, p. 143. A, B = LEPTOGIUM LACERUM (*Sw.*). Typical but sterile. C = L. LACERUM f. FIMBRIATUM, *Hffm.* Sterile. This is the *Lichen tremelloides* of Hudson and our older lichenists.

F. 32. *Lichenoides* pellucidum, Latucæ folio sinuoso, p. 145, = LEPTOGIUM MARGINELLUM (*Sw.*). Sufficiently typical and fertile, though in several fragmentary specimens. Correctly referred to this species by Acharius.

F. 33. *Lichenoides* tenue crispum, foliis parvis depressis, p. 145, = LEPTOGIUM SINUATUM (*Huds.*). Fertile. Several specimens; but all, with a single exception, sterile.

F. 34. *Lichenoides* tenue crispum, foliis exiguis surrectis, p. 146. A = LEPTOGIUM LACERUM * PULVINATUM (*Hffm.*). Several sterile fragmentary specimens. B = LEPTOGIUM SINUATUM (*Huds.*) minus. Fertile. Not distinguished by authors from the preceding. Along with these are fragments of *Collema cheileum*, fertile, and of *C. crispum*, var. *ceramoides*, Borr. Sterile.

F. 35. *Lichenoides* tenue crispum et veluti aculeatum, p. 146, = LEPTOGIUM LACERUM * PULVINATUM (*Hffm.*). Sterile. This differs from 34 A only in having the laciniæ more crowded and denticulate. The figures, however, *sub litt. l. m, n* are by no means very characteristic. This has not hitherto been identified.

Series II. Drier and sapless species, scutellate.

Division I. Scutellæ seated on a pedicle.

Tab. XX., Dill. Hist. Musc.

F. 39. *Lichenoides* glaucum perlatum, subtus nigrum et cirrosum, p. 147. A = PARMELIA PERLATA (*L.*). Sterile and fragmentary. B = P. PERLATA f. SOREDIATA, *Schær.* Infertile. Referred by Ach. in L. U. to his var. *olivetorum*. C = PARMELIA BORRERI, *Turn.* Sterile. Now for the first time identified. D = P. PERLATA (*L.*). Typical and fertile. E = a small sterile condition of the same.

F. 42. *Lichenoides* glaucum, foliorum laciniis crinitis, p. 149. A = PARMELIA PERFORATA, *Ach.* Typical and fertile. B = PARMELIA HYPOTROPA, *Nyl.* Sterile. According to Nylander *in litt.*,

this is a proper species, as shown by the thalline reactions, viz. K^{+}_{+} (medulla fl. rubr.). Not previously distinguished by lichenists.

F. 43. *Lichenoides* platyphyllum, marginibus crinitis, p. 149, = PARMELIA CORNICULANS, *Nyl. in hb. Horsfield*? Of this there is only a small sterile fragment (atypical) in hb. Dill., which though agreeing in the Nylanderian reactions with this species, K(CaCl)+ reddish, is necessarily somewhat doubtful. Referred by Fries to *P. hottentotta*.

F. 44. *Lichenoides hypotropa* f. *parmata*, Nyl. *in litt.* Spores 0·009–0·011 millim. long, 0·007–0·008 millim. thick. The specimen in hb. Dill. is evidently a portion of the original one in hb. Buddle. Hitherto not distinguished by authors from *P. perforata*, to which it has been referred.

F. 45. *Lichenoides* hispidum majus et rigidius, scutellis nigris, p. 150. A = PHYSCIA CILIARIS (*L.*). Fertile. B, C = f. MELANOSTICTA, *Ach.* With spermogones. D = f. AGRIOPA, *Ach.*, a young state. Some of the apothecia in the type have, as will be seen from the figure, the margin proliferous and the laciniolæ fimbriated (f. *actinota*, Ach.).

F. 46. *Lichenoides* hispidum minus et tenerius, scutellis nigris, p. 152. A, B = PHYSCIA LEPTALEA, *Ach.* (A = young and sterile state). C, E = PHYSCIA TENELLA (*Scop.*). D = PH. LEPTALEA saxicole, with thallus and apothecia less evolute. Figs. C, E, have not sufficiently been distinguished from the others.

F. 47. *Lichenoides* quod Lichen pulmonarius minimus, arboribus innascens, ad margines radicatus, superne cinereo-fuscus, inferne anthracinus, receptaculis florum fuscis, Mich., p. 154, = PHYSCIA OBSCURA, var. CHLOANTHA (*Ach.*). Of this there is no specimen in hb. Dill. Identified by Fries in Index Dill.

F. 49. *Lichenoides* ceratophyllon obtusius et minus ramosum, p. 154. A, B = PARMELIA PHYSODES (*L.*), of which A is fertile. C = P. PHYSODES, var. LABROSA, *Ach.* Sterile. D = PARMELIA CENTRIFUGA (*L.*). Of this there is only a small and not very characteristic specimen, though fertile. Hitherto not determined.

Division II. Species with the scutellæ sessile and closely adnascent to the leaves.

Subdivision I. Leaves narrower or broader, scutellæ (with a few exceptions) unicolorous.

Tab. XXI., Dill. Hist. Musc.

F. 50. *Lichenoides* angustifolium planum, crinibus nigris, p. 156,

= PHYSCIA LEUCOMELA (*L.*). Of this there is only a small sterile fragment; and the figure is not very characteristic.

F. 51. *Lichenoides* subhirsutum teres, scutellis parvis nigris, p. 157, = PHYSCIA INTRICATA (*Desf.*). The specimen figured, which is extant in hb. Dill., is most probably a portion of that sent by Michaeli to Sherrard.

F. 52. *Lichenoides* cornutum amarum, superne cinereum, inferne nigrum, p. 157, = EVERNIA FURFURACEA (*L.*). The specimen figured is not in hb. Dill.; and the two specimens which are there are smaller and sterile, though sufficiently typical.

F. 53. *Lichenoides* corniculatum album subspinosum, scutellis flavescentibus, p. 159, = PHYSCIA VILLOSA (*Ach.*). The specimen said to have been sent by Michaeli is not in hb. Dill., where it is represented only by two fragmentary laciniæ almost indeterminable, one of which is nearly quite naked with the thalline receptacle abraded. Referred by Acharius, in Meth. p. 256, to his *Parmelia solenaria*, which, as indicated by Fries in L. E., does not differ from *Physcia villosa*.

F. 54. *Lichenoides* corniculatum candidum molle, segmentis angustis, p. 159, = EVERNIA PRUNASTRI, var. GRACILIS, *Ach.* The specimen is sterile, and the figure is by no means very characteristic. Not identified by Acharius, and referred by Fries to var. *arenaria*, Retz., which, according to Th. Fries, Scand. p. 30, is a form of *E. divaricata* (L.).

F. 55. *Lichenoides* cornutum bronchiale molle, subtus incanum, p. 160. A = EVERNIA PRUNASTRI (*L.*) (sorediifera). Sterile. B = RAMALINA FASTIGIATA (*Pers.*). Fertile. C, D = young states of *Evernia prunastri*, Ach. E = R. POLLINARIA f. HUMILIS, *Ach.* F, G, I. Of these there are no specimens in hb. Dill., nor are any figs. given; but E probably = R. POLLINARIA, and G, I = R. FASTIGIATA. H = EVERNIA PRUNASTRI f. RETUSA, *Ach.* C, E, H have not hitherto been rightly determined.

F. 56. *Lichenoides* lacunosum candidum glabrum, Endiviæ crispæ facie, p. 162. A = PLATYSMA NIVALE (*L.*). There are several specimens of this, but all sterile. B = PL. CUCULLATUM (*Bell.*). Of this there are only the two sterile fragments represented in the figure. Not identified by Acharius, but correctly referred to this species by Fries.

F. 57. *Lichenoides* lacunosum lacerum, latius et angustius, p. 163. A, B, C = RAMALINA EVERNIOIDES, *Nyl.* B is very characteristic; but all the specimens are infertile. The identity of

this was first pointed out by me in Journ. Bot. 1872, p. 73. D, E=R. POLLINARIA, *Ach.* Sterile.

Tab. XXII., Dill. Hist. Musc.

F. 58. *Lichenoides* membranaceum, tubæ Fallopianæ æmulum, p. 165,=PLATYSMA GLAUCUM, var. FALLAX f. CORALLOIDEA, *Wallr.* Of this there is no specimen, the figure being copied from that of Michaeli, with the marginal fimbriæ added from a specimen in hb. Sherrard.

F. 59. *Lichenoides* longifolium rugosum, rigidum, p. 165. A, B=RAMALINA FRAXINEA (*L.*) A young state. C=var. AMPLIATA, *Ach.* D=the mature and typical condition. All these states, represented in the fig. as occurring in the same specimen, are to be seen separately along with others in hb. Dill.

F. 60. *Lichenoides* fuciforme tinctorium, corniculis brevioribus et obtusioribus, p. 167,=ROCCELLA FUCIFORMIS, *Ach.* (minor). Various states, stunted and infertile. Erroneously referred by Acharius in Syn. p. 224, to *R. phycopsis*, but rightly identified by Fries.

F. 61. *Lichenoides* fuciforme tinctorium, corniculis longioribus et acutioribus, p. 168,=ROCCELLA FUCIFORMIS, *Ach.* The specimens are quite typical; and in A, B, the thallus is, as usual, sorediate. C, D (Tab. XXIII.), neither of which is in hb. Dill., represent the same species in a fertile condition.

Tab. XXIII., Dill. Hist. Musc.

F. 62. *Lichenoides* coralliforme rostratum et canaliculatum, p. 170. A=RAMALINA CALICARIS (*Hffm.*). There is also along with this in hb. Dill. a sterile specimen of *R. scopulorum* (Dcks.); indeed the two were generally confused by the older authors. B=R. CALICARIS, var. SUBAMPLIATA, *Nyl.* The figure is not very characteristic of the specimens. C=R. FASTIGIATA (*Pers.*). The larger and more typical state. The two latter have not been distinguished by authors.

F. 63. *Lichenoides* segmentis argutioribus, ad margines verrucosis et pulverulentis, p. 172. A=RAMALINA FASTIGIATA f. MINUTULA, *Ach.* A young state. B, C=R. FARINACEA (*L.*). Sterile. D, E=R. FARINACEA f. PHALERATA, *Ach.* All rightly determined by Acharius in L. U. p. 607.

F. 67. *Lichenoides*, quod Lichen terrestris fuscus hirsutus asper receptaculis florum atro-rufis coronatus, Mich. p. 174. Of this there

is no specimen in hb. Dill., who copies simply the fig. of Michaeli, which Acharius, in Meth. p. 302, refers to (*Cornicularia*) *Cetraria aculeata*.

Subdivision II. Species with the leaves closely adnascent, and the scutellæ unicolorous or bicolorous.

F. 68. *Lichenoides* tenuissimum, scutellis exiguis miniatis, p. 175, = LECANORA ELEGANS (*Link*) (minor). There is no specimen present; but there can be little doubt that authors have rightly referred it to this species.

F. 69. *Lichenoides* angustifolium fuscum, scutellis pullis, p. 175, = PHYSCIA AQUILA (*Ach.*). Of this there are two typical and fertile specimens.

F. 70. *Lichenoides* cinereum, segmentis argutis stellatis, scutellis nigris, p. 176. A, B = P. AIPOLIA f. ACRITA, *Ach.* Fertile. Rightly determined by Acharius in L. U. p. 478. C = P. CÆSIA (*Hffm.*). Fragmentary and sterile. Not sufficiently distinguished from the preceding by authors.

F. 71. *Lichenoides* glaucum orbiculare, segmentis latiusculis, scutellis nigris, p. 177. A. There are two small specimens of this, of which one = PHYSCIA PULVERULENTA (*Schreb.*), and the other = P. STELLARIS (*L.*). B = P. PULVERULENTA f. ARGYPHÆA, *Ach.* C = P. PITYREA (*Ach.*). Infertile. Along with this is also a sterile fragment of *P. speciosa* (Wulf.) from Virginia. D = P. PULVERULENTA f. PANNIFORMIS, *Cromb.* Sparingly fertile. With the exception of A pro p. (*P. pulverulenta*), the others have not hitherto been determined.

F. 72. *Lichenoides* viride, segmentis angustis distortis, scutellis pullis, p. 178. A = PHYSCIA ULOTHRIX (*Ach.*). Fertile. B = P. OBSCURA, var. VIRELLA, *Ach.* The specimens of both are fragmentary, much worn, and with difficulty determinable. This latter has not been distinguished by lichenists.

Subdivision III. Leaves closely adnascent, moderately broad (except n. 81).

F. 73. *Lichenoides* tenue et molle, Agarici facie, p. 179, = COCCOCARPIA PLUMBEA (*Lghft.*) The specimen figured, though fragmentary, is sufficiently typical and fertile. Along with it are two specimens of *Pannaria rubiginosa* (Thnb.), which were probably added at a later period.

F. 74. *Lichenoides* cartilagineum, scutellis fulvis planis, p. 179,

=SQUAMARIA CRASSA, *DC.* Of this there are four specimens, all of which are typical and fertile.

F. 75. *Lichenoides* imbricatum viridans, scutellis badiis, p. 180. A=PARMELIA CONSPERSA (*Ehrh.*). Typical and fertile. B=PARMELIA CONSPERSA f. ISIDIATA, *Anzi.* Fertile. Along with this latter there is also a small specimen of *P. centrifuga* (L.), from which the preceding was not distinguished by our earlier lichenists.

F. 76. *Lichenoides* vulgare sinuosum foliis et scutellis luteis, p. 180. A, B, C=PHYSCIA PARIETINA (*L.*). Fertile. (B=spermogoniiferous state). Along with these there are also two fertile specimens of f. *viridescens.*

F. 77. *Lichenoides* olivaceum, scutellis lævibus, p. 182. A=PARMELIA OLIVACEA (*L.*). Typical and fertile. B=P. FULIGINOSA (*Fr.*). Infertile. C.=P. SUBAURIFERA, *Nyl.* Sterile. The last two have not hitherto been determined.

F. 78. *Lichenoides* olivaceum, scutellis amplioribus verrucosis, p. 184. A, B=PARMELIA EXASPERATA (*Ach.*), of which B is fertile. In addition to the two specimens figured, there are several others very fragmentary and scarcely determinable. Rightly referred to this species (s. n. β *aspidota*) by Acharius in Meth. p. 214.

F. 79. *Lichenoides* acetabulis cutaneis et rugosis, p. 185,=PARMELIA ACETABULUM (*Neck.*). There is no specimen in hb. Dill., the one figured being taken from hb. Sherrard.

F. 80. *Lichenoides* saxatile tinctorium, foliis pilosis purpureis, p. 185,=PARMELIA SAXATILIS, var. OMPHALODES, *Ach.* There are no specimens of B, C, D; and A, of which a portion is delineated in the figure, is infertile. D is evidently a smaller state with young apothecia.

F. 81. *Lichenoides* tinctorium atrum, foliis minimis crispis, p. 188,=PLATYSMA FAHLUNENSE (*L.*). Of this there are only a very few fragments in hb. Dill., upon which one or two young apothecia are visible.

F. 82. *Lichenoides* tinctorium glabrum, vesiculosum, p. 188,=PLATYSMA GLAUCUM f. AMPULLACEUM (*L.*). There is no specimen present; and as the figure is inserted in its place, as in other similar instances, there seems never to have been a specimen. But *vide* Withering, Arr. iv. p. 68.

F. 83. *Lichenoides* vulgatissimum cinereo-glaucum, lacunosum et cirrosum, p. 188. A=PARMELIA SAXATILIS (*L.*). Typical,

but sterile. B=P. SAXATILIS, var. SULCATA (*Tayl.*). Fertile. C, D=P. SAXATILIS f. FURFURACEA, *Schær.* The last two have not hitherto been distinguished. Along with D is a fragment of *Platysma diffusum* (Web.), lignicole.

On the same sheet as the above is a specimen named Muscus arboreus licheniformis purpurascens, Ray, Syn. ii. p. 23, n. 8,= PARMELIA SAXATILIS, var. SULCATA (*Tayl.*). Infertile, with the thallus abnormally (through maceration) of a purplish colour.

Subdivision IV. Leaves closely adnascent, broader.

F. 96. *Lichenoides* Endiviæ foliis crispis et splendentibus, subtus nigricantibus, p. 192. A=PLATYSMA GLAUCUM (*L.*). Sterile and sorediate at the margins. B=a smaller state with the laciniæ suberect.

F. 97. *Lichenoides* caperatum, e rosaceo, expansum e sulphureo virens, p. 193. A=PARMELIA CAPERATA (*L.*). Infertile. B= smaller state. C=fertile condition. Var. *rufescens*, Dill. p. 195, is not in his hb.

F. 98. *Lichenoides* læte virens, scutellis fulvis, p. 195. A= RICASOLIA LÆTEVIRENS (*Lghtf.*). Typical and fertile. B=an old state with young apothecia.

Tab. XXVI., Dill. Hist. Musc.

F. 99. *Lichenoides* cumatile, foliis tenacibus, eleganter laciniatis, p. 197,=RICASOLIA GLOMULIFERA (*Lghtf.*). Fertile, and with the parasitic *Homodium bolacinum* (Schær.).

F. 100. *Lichenoides* fuliginosum et pulverulentum scutellis rubiginosis, p. 198. A=STICTINA FULIGINOSA (*Dcks.*). The specimen figured is broken up into two portions, both of which are fertile. B, C=S. LIMBATA (*Sm.*). Two small sterile specimens are present.

Series III. More arid species, peltate and clypeate; the bracts various, but not hollow, nor scutellate.

Division I. Peltæ entirely adnate to the margins of the leaves or their appendices.

Tab. XXVII., Dill. Hist. Musc.

F. 101. *Lichenoides* polyschides villosum et scabrum, peltis parvis, p. 109,=STICTINA SYLVATICA (*L.*). The specimen in hb. Dill. is entirely sterile. In describing and delineating the form

and position of the apothecia, Dillenius evidently paid little attention to his own dictum in p. 200:—"Quantum videre possint homines, si imaginatione polleant."

F. 102. *Lichenoides* digitatum cinereum, Lactucæ foliis sinuosis, p. 200. A, B, C, D = PELTIGERA SPURIA (*Ach.*). Various states, more or less evolute. Rightly identified by Acharius in L. U. p. 518. E = P. CANINA (*L.*). Typical and fertile. Along with these are also some fragmentary specimens of *P. polydactyla.*

F. 103. *Lichenoides* digitatum rufescens, foliis Lactucæ crispis, p. 103. A = PELTIGERA RUFESCENS (*Hffm.*). Typical, and at once distinguished from the preceding, as Dillenius observes, by the thallus being glabrous on the upper surface. B = a state with the margins sparingly isidiiferous, but is a bad specimen of this common form (f. *prætextata*, Flk.).

Tab. XXVIII., Dill. Hist. Musc.

F. 104. *Lichenoides* subfuscum, peltis horizontalibus planis, p. 205. A = PELTIGERA HORIZONTALIS (*Hffm.*) (minor). A state closely approaching to var. *muscorum*, Schær., but with the apothecia rather larger. B = P. HORIZONTALIS. Typical. C = P. SCUTATA (*Dcks.*). The specimen in hb. Dill. seems to be entirely referable to this, though infertile and otherwise not in very good condition. Hitherto not identified.

F. 105. *Lichenoides* fuscum, peltis posticis ferrugineis, p. 206. A = NEPHROMIUM LÆVIGATUM (*Ach.*). A small but fertile specimen. B, C = N. LÆVIGATUM, var. PARILE (*Ach.*). Sterile. This latter was, strangely, not identified by Acharius.

F. 106. *Lichenoides* digitatum læte virens, verrucis nigris notatum, p. 207, = PELTIDEA APHTHOSA (*L.*). Fertile, and a good, characteristic specimen.

F. 107. *Lichenoides* cinereum polydactylon, p. 207, = PELTIGERA POLYDACTYLA, *Hffm.*, of which C is sterile. Of this there are several specimens sufficiently typical.

F. 108. *Lichenoides* membranaceum pellucidum, peltis digitatis geminatis, p. 208, = PELTIGERA POLYDACTYLA f. PELLUCIDA, *Ach.* This is but a state of the type in which the fertile lobules are geminate.

F. 109. *Lichenoides* parum virescens, peltis nigricantibus planis, p. 208, = PELTIDEA VENOSA (*L.*). The three fragments delineated in the figure are present in hb. Dill.

F. 110. *Lichenoides* (peltatum forte) terrestre virescens, orbiculatis minimis foliis, p. 209,=NORMANDINA LÆTEVIRENS (*T. & B.*). There is no specimen of this; but judging from the description (for the figure is no guide), it may safely be referred to this species, as indicated by Fries in 'Index Dill.'

F. 111. *Lichenoides* rigidum, Eryngii folia referens, p. 209. A=CETRARIA ISLANDICA (*L.*). Typical, but sterile. B=C. ISLANDICA f. DILATATA, *Norrl.* Fertile. Of this there is no specimen; but it is sufficiently identified from the figure.

F. 112. *Lichenoides* Eryngii folia referens, tenuioribus et crispioribus foliis, p. 212,=CETRARIA ISLANDICA, var. CRISPA, *Ach.* Sterile. There is no specimen in hb. Dill., the figure being copied from Buxbaum, Cent. ii. t. 6. f. 2, *vide* Dill. *l. c.*

Division II. Pileate species, with the peltæ on a very short pedicle inserted in their centre.

F. 113. *Lichenoides* pulmoneum reticulatum vulgare, marginibus peltiferis, p. 212. A=STICTA PULMONARIA (*L.*). Typical and fertile. B=young state. C=f. SOREDIATA. There are also several other sterile specimens.

F. 114. *Lichenoides* pulmoneum villosum, superficie scrobiculata et peltata, p. 216,=STICTINA SCROBICULATA (*Scop.*). Typical, but sterile.

F. 115. *Lichenoides* damæ cornua referens, subtus spongiosum, p. 217,=STICTA DAMÆCORNIS (*Sw.*). Fertile. Probably quite typical; but the specimen is broken up into several portions.

F. 116. *Lichenoides* corneum, marginibus eleganter fimbriatis, p. 218. A=GYROPHORA CYLINDRICA (*L.*). Typical, with young apothecia. B=G. CYLINDRICA f. DENTICULATA, *Ach.* Fertile. This is the *Lichen proboscideus* of Hudson (not of Linnæus).

Division III. Species whose peltæ are without a pedicle.

F. 117. *Lichenoides* coriaceum cinereum, peltis atris compressis, p. 219,=GYROPHORA GRISEA (*Hffm.*). Typical and fertile. In hb. Dill. there are two specimens, received from Celsius; but in hb. Buddle is a British specimen from St. Vincent's Rocks near Bristol.

F. 118. *Lichenoides* rugosum durum pullum, peltis atris verrucosis, p. 118,=GYROPHORA EROSA f. TORREFACTA (*Ach.*).

Fertile. The specimen in hb. Dill. is not British, though this form occurs in the Highlands, as long ago indicated in Lghtf. 'Fl. Scot.' p. 862. Erroneously referred by Hudson to *Lichen proboscideus*, L.

F. 119. *Lichenoides* atrum, corii Persici instar exasperatum, p. 220, = GYROPHORA ARCTICA (*Ach.*). Fertile; but not very typical, the specimens consisting of one small and two fragmentary ones.

F. 120. *Lichenoides* subtus croceum, peltis appressis, p. 221, = SOLORINA CROCEA (*L.*). The two specimens in hb. as in figure, one of which is fertile, are very fragmentary.

F. 121. *Lichenoides* Lichenis facie, peltis acetabulis immersa, p. 221, = SOLORINA SACCATA (*L.*), of which A is a young and small state.

Series V. Species of which the peltæ or scutellæ have not yet been observed.

F. 127. *Lichenoides* coriaceum nebulosum cinereum punctatum, subtus fulvum, p. 223. A = ENDOCARPON MINIATUM, var. COMPLICATUM (*Sw.*). Infertile. Not distinguished by authors from the following. B = ENDOCARPON MINIATUM (*L.*). Typical and spermogoniiferous.

F. 128. *Lichenoides* imbricatum luridum, p. 124, = ENDOCARPON FLUVIATILE (*Web.*). Fertile. One of the specimens is entirely of a dark lurid colour.

F. 129. *Lichenoides* tenue pullum, foliis utrinque glabris, p. 225, = GYROPHORA POLYPHYLLA (*L.*). Sterile, but quite typical.

F. 130. *Lichenoides* pullum superne et glabrum, inferne nigrum et cirrosum, p. 130, = GYROPHORA POLYRRHIZA (*L.*). Infertile, but otherwise sufficiently characteristic. Erroneously referred by Hudson to *Lichen velleus*, L.

F. 131. *Lichenoides* pustulatum cinereum et veluti ambustum, p. 226, = UMBILICARIA PUSTULATA (*L.*). Of this there are two specimens sterile, but quite typical.

F. 133. *Lichenoides*, quod Lichen pulmonarius terrestris clypeatus minimus et indivisus, virescens, *Mich.* p. 228, = ENDOCARPON HEDWIGII, *Ach.* There is no specimen of this; but the figures of Mich. and Dill. appear, as understood by authors, to refer to this species.

Fig. 134. *Lichenoides*, quod Lichen pulmonarius saxatilis viridis, foliis vix conspicuis, squamatim sibi incumbentibus, receptaculis florum nigris, *Mich.* p. 228,=LECIDEA LURIDA, *Ach.* Of this also there is no specimen present, nor is the figure sufficiently good—though, in connexion with the description, it most probably denotes this species.

F. 135. *Lichenoides* glaucum, squamis crassis brevissimis, *Hall.* p. 228. A=LECIDEA VESICULARIS (*Hffm.*). In hb. Dill. there is only a very small fragment, consisting of one or two sterile squamules which apparently belong to this species. Hitherto not identified. B. Nothing corresponding to this is present.

APPENDIX. NEW SPECIES.

Tab. LXXXII., Dill. Hist. Musc.

F. 1. *Coralloides* perforatum, corniculis brevissimis, p. 544,= CLADONIA FURCATA f. TRUNCATA, *Flk.* Fertile. According to Nylander *in litt.*, this form belongs to *racemosa*, Hffm. Referred by Fries in Index Dill. to his var. *cristata.*

F. 2. *Lichenoides* granosum subglaucum, tuberculis planis nigricantibus, p. 544,=PANNARIA LEPIDIOTA (*Smmrf.*). The specimen in hb. Dill. is very fragmentary, but fertile. Erroneously referred by Lightfoot in Fl. Scot. ii. p. 405, to his *Lichen cæruleo-nigricans*,=LECIDEA VESICULARIS, *Hffm.*

F. 3. *Lichenoides* foliis glaucis crinitis, scutellis amplis perforatis, p. 544,=PARMELIA HYPOTROPA f. PARMATA, *Nyl.* *Vide* sub t. xx. f. 44, p. 150. The specimen of this in hb. Dill. is quite identical with that already referred to in hb. Buddle, but with still larger apothecia.

F. 4. *Lichenoides* corniculatum rigidum spadiceum, p. 545,= PLATYSMA RICHARDSONII (*Hook.*). Sterile. The identity of this species with the figure was first pointed out by Tuckerman in 'Proceed. Amer. Acad.' v. p. 398, and is now confirmed by the specimen in hb. Dill.

F. 5. *Lichenoides* coriaceum, latissimo folio umbilicato et verrucoso, p. 545,=GYROPHORA VELLEA (*L.*). Sterile. The specimen, of which the figure is not at all good, represents a very large and old state of this species.

Tab. LXXXIV., Dill. Hist. Musc.

F. 10. *Usnea* ceratoides candicans, glabra et odorata, p. 548, =RAMALINA ARABUM, *Ach.* Fertile. *Vid.* sub T. xiii. f. 14.

F. 11. *Lichenoides* platyphyllum, marginibus crinitis, p. 548, =PARMELIA CORNICULANS, *Nyl.* Fertile. Of this, as well as of the following species, there are no specimens in hb. Dill., whose descriptions and figures are made, as stated by him, from specimens in the "Hortus Siccus of Du Bois." Judging, however, from the character of the margins and apothecia as depicted in the figure, and its identity as affirmed by Dill. with t. xx. f. 43, it is quite referable to the above species.

F. 12. *Lichenoides* lacunosum rutilum, marginibus planis, p. 549,=STICTA AURATA, *Ach.* Sterile. There can be little doubt that this, and not *Stictina crocata*, is the plant figured and described by Dillenius, as pointed out by Sir J. E. Smith. *Vide* Ach. Meth. p. 277.

Tab. LXXXV., Dill. Hist. Musc.

F. 14. *Coralloides* dichotomus gracilius et procerius, corniculis creberrimis, p. 549,=CLADONIA FURCATA (typical). Referred by Fries to his *Evernia furcellata.*

CONSPECTUS OF THE DILLENIAN LICHENS.

Family COLLEMACEI.

Tribe *Collemei.*

Collema furvum, *Ach.*
—— furvum f. tunæforme (*Ach.*).
—— pulposum (*Bernh.*).
—— tenax, *Ach.*
—— cheileum, *Ach.*
—— melænum f. marginale (*Ach.*).
—— nigrescens (*Huds.*).
—— fasciculare (*L.*).
Leptogium plicatile (*Ach.*).
—— fluviatile (*Huds.*).
—— lacerum (*Sw.*).
—— lacerum f. fimbriatum (*Hffm.*).
—— *pulvinatum (*Hffm.*).
—— marginellum (*Sw.*).

Family LICHENACEI.

Tribe *Caliciei.*

Calicium hyperellum, *Ach.*
—— trachelinum, *Ach.*

Tribe *Sphærophorei.*

Sphærophoron coralloides, *Pers.*
—— compressum, *Ach.*
—— fragile (*L.*).

Tribe *Bæomycetei.*

Bæomyces roseus (*Pers.*).
—— rufus f. rupestris (*Pers.*).

Tribe *Stereocaulei.*

Stereocaulon denudatum, *Flk.*

Tribe *Cladoniei.*

Pycnothelia papillaria (*Ehrh.*).
Cladonia alcicornis (*Lghtf.*).
—— pyxidata f. simplex.
—— pyxidata f. prolifera.
—— fimbriata, *Hffm.*
—— fimbriata f. tubæformis (*Hffm.*).
—— fimbriata f. radiata (*Ach.*).
—— fimbriata f. denticulata, *Flk.*
—— fimbriata, var. exilis, *Ach.*

*Cladonia nemoxyna, *Ach.*
—— pityrea, *Flk.*
—— acuminata (*Ach.*).
—— verticillata, *Hffm.*
—— gracilis, *Ach.*
—— gracilis f. chordalis, *Flk.*
—— subcornuta, *Nyl.*
—— furcata, *Hffm.*
—— furcata, var. racemosa, *Flk.*
—— furcata f. spinosa (*Huds.*).
—— furcata f. truncata (*Flk.*).
—— furcata, var. recurva (*Hffm.*).
—— *pungens, *Flk.*
—— pungens f. foliacea, *Flk.*
—— crispata, *Ach.*
—— crispata f. ventricosa (*Del.*).
—— crispata f. cetrariæformis (*Del.*).
—— squamosa f. cucullata (*Del.*).
—— subsquamosa, *Nyl.*
—— cariosa (*Ach.*).
—— coccifera (*L.*).
—— coccifera f. extensa (*Hffm.*).
—— coccifera, var. asotea (*Ach.*).
—— bellidiflora (*Ach.*).
—— bellidiflora f. vestita (*Ach.*).
—— macilenta, *Hffm.*
—— macilenta f. polydactyla, *Flk.*
—— macilenta f. filiformis (*Sm.*).
—— macilenta, var. clavata (*Ach.*).
—— bacillaris (*Ach.*).
Cladina rangiferina (*L.*).
—— sylvatica (*Hffm.*).
—— sylvatica f. alpestris (*L.*).
—— uncialis (*L.*).
—— uncialis, f. adunca (*Ach.*).
—— uncialis, f. obtusata (*Ach.*).

Tribe *Roccellei.*

Roccella tinctoria, *DC.*
—— fuciformis, *Ach.*

Tribe *Ramalinei.*

Ramalina arabum, *Ach.*
—— calicaris (*Hffm.*).
—— calicaris, var. subampliata, *Nyl.*
—— farinacea (*L.*).
—— farinacea f. phalerata, *Ach.*
—— fraxinea (*L.*).
—— fraxinea f. ampliata, *Ach.*
—— fastigiata, *Ach.*
—— fastigiata f. minutula, *Ach.*
—— pollinaria, *Ach.*
—— pollinaria f. humilis, *Ach.*
—— evernioides, *Nyl.*

Tribe *Usneei.*

Usnea florida (*L.*).
—— strigosa, *Ach.*
—— hirta (*L.*).
—— hirta f. sorediata.
—— dasypoga, *Fr.*
—— ceratina, *Ach.*
—— albo-punctata, *Nyl.*
—— articulata, *Ach.*
Chlorea canariensis (*Ach.*).

Tribe *Alectoriei.*

Alectoria jubata (*L.*).
—— jubata, var. chalybeiformis, *Ach.*
—— bicolor (*Ehrh.*).
—— sarmentosa, *Ach.*

Tribe *Cetrariei.*

Cetraria Islandica (*L.*).
—— islandica f. dilatata, *Norrl.*
—— islandica, var. crispa, *Ach.*
—— Delisei * fastigiata, *Del.*
—— aculeata (*Ehrh.*).
—— aculeata, var. hispida (*Lghtf.*).
—— aculeata, var. acanthella, *Ach.*
Platysma Richardsonii (*Hook.*).
—— nivale (*L.*).
—— cucullatum (*Bell*).
—— glaucum (*L.*).
—— glaucum f. ampullaceum (*L.*).
—— glaucum, var. fallax (*Web.*).
—— fallax f. coralloides, *Wallr.*

Tribe *Parmeliei.*

Evernia furfuracea (*L.*).
—— prunastri (*L.*).
—— prunastri, var. gracilis, *Ach.*
—— prunastri f. phellina, *Ach.*
—— prunastri f. retusa (*Ach.*).
—— divaricata, *Ach.*
Parmelia perlata (*L.*).
—— perforata, *Ach.*
—— hypotropa, *Nyl.*
—— hypotropa f. parmata, *Nyl.*
—— corniculans, *Nyl.*
—— saxatilis (*L.*).
—— saxatilis f. furfuracea (*Schær.*).
—— saxatilis, var. sulcata (*Tayl.*).
—— saxatilis, var. omphalodes (*L.*).
—— Borreri (*Turn.*).
—— caperata (*L.*).
—— conspersa (*Ehrh.*).
—— conspersa f. isidiata (*Anzi*).
—— centrifuga (*L.*).

Parmelia acetabulum, *Neck.*
—— subaurifera, *Nyl.*
—— olivacea (*L.*).
—— exasperata, *Ach.*
—— fuliginosa, *Fr.*
—— lanata (*Ach.*).
—— lanata, var. reticulata (*Wulf.*).
—— tristis (*Wehr.*).
—— physodes (*L.*).
—— physodes, var. labrosa, *Ach.*

Tribe *Stictei.*

Stictina fuliginosa (*Dcks.*).
—— limbata (*Sw.*).
—— sylvatica (*Huds.*).
Lobaria scrobiculata (*Scop.*).
—— pulmonaria (*L.*).
—— pulmonaria f. sorediata.
Sticta damæcornis (*Sw.*).
—— aurata, *Ach.*
Ricasolia glomulifera (*Lghtf.*).
—— lætevirens (*Lghtf.*).

Tribe *Peltigerei.*

Nephromium lævigatum (*Ach.*).
—— lævigatum, var. parile (*Ach.*).
Peltidea aphthosa (*L.*).
—— venosa (*L.*).
Peltigera canina (*L.*).
—— rufescens (*Hffm.*).
—— spuria, *Ach.*
—— polydactyla, *Hffm.*
—— polydactyla, f. microcarpa, *Ach.*
—— scutata (*Dcks.*).
—— horizontalis (*Hffm.*).
Solorina crocea (*L.*).
—— saccata (*L.*).

Tribe *Physciei.*

Physcia flavicans (*Sw.*).
—— villosa (*Ach.*).
—— intricata (*Duf.*).
—— chrysophthalma (*L.*).
—— parietina (*L.*).
—— ciliaris (*L.*).
—— ciliaris, f. melanosticta (*Ach.*).
—— ciliaris, f. agriopa (*Ach.*).
—— leucomela (*L.*).
—— pulverulenta (*Schrb.*).
—— pulverulenta f. argyphæa (*Ach.*).
—— pulverulenta f. panniformis, *Cromb.*
—— pityrea (*Ach.*).
—— aquila (*Ach.*).
Physcia stellaris (*L.*).
—— leptalea (*Ach.*).
—— tenella (*Scop.*).
—— aipolia f. acrita (*Ach.*).
—— cæsia (*Hffm.*).
—— obscura, var. chloantha (*Ach.*).
—— obscura, var. virella (*Ach.*).
—— ulothrix, *Fr.*

Tribe *Gyrophorei.*

Umbilicaria pustulata (*L.*).
Gyrophora arctica (*Ach.*).
—— cylindrica (*L.*).
—— cylindrica f. denticulata (*Ach*).
—— erosa f. torrefacta (*Ach.*).
—— polyphylla (*L.*).
—— polyrrhiza (*L.*).
—— grisea (*Hffm.*).
—— vellea (*L.*).

Tribe *Lecanorei.*

Pannaria lepidiota (*Smmrf.*).
Coccocarpia plumbea (*Lghtf.*).
Squamaria crassa, *DC.*
Placodium murorum (*Hffm.*).
—— elegans (*Link.*).
Lecanora ferruginea (*Huds.*).
—— citrina (*Ach.*).
—— galactina, *Ach.*
—— atra (*Huds.*).
—— subfusca (*L.*).
—— fruticulosa, *Eversm.*
—— parella, *Ach.*
—— tartarea (*L.*).
—— ventosa (*L*).

Tribe *Pertusariei.*

Pertusaria communis, *DC.*
—— fallax (*Pers.*).
—— amara, *Ach.*
—— globulifera f. discoidea (*Sm.*).

Tribe *Thelotromei.*

Urceolaria scruposa, *Ach.*

Tribe *Lecideei.*

Lecidea lurida, *Ach.*
—— canescens (*Dcks.*).
—— vesicularis (*Hffm.*).
—— parasema, *Ach.*
—— melina (*Kphb.*).
—— geographica (*L.*).

Tribe *Graphidei.*

Graphis scripta, *Ach.*
Opegrapha varia f. signata (*Ach.*).
Arthonia cinnabarina, var. kermesina (*Schær.*).

Tribe *Pyrenocarpei.*

Normandia lætevirens (*T. & B.*).
Endocarpon miniatum (*L.*).
—— miniatum, var. complicatum (*Sw.*).
—— fluviatile, *DC.*
—— Hedwigii, *Ach.*

INDEX.

Abbay, Rev. R., Observations on Hemileia vastatrix, the Coffee-leaf disease, 173.
Aberrant tribes of Liliaceæ, J. G. Baker on, 405, 407.
Abies magnifica, palisade cells wanting, 549; nobilis, leaves of, 548, 549; Nordmannia, leader shoot of, 548, (ftnote) 550, and changes colour, leaf of, 550.
Absorption of rain and dew by the green parts of plants, 313.
——, Boussingault's exper. on, 313; by epidermis of herbaceous internodes, 316; by leaves attached to branches, 318; detached leaves on surface water, 321; Duchartre's exper., 315; early experiments on, 314; exper. on Symphocarpus, 317; exper. showing lower leaves nourished by, 319; introductory remarks on, 313; leaf, one part to another, 319.
Acalypha, 230, 256.
Acalypheæ, 228.
Acarospora chlorophana, 357.
Acedilanthus anticleoides, 473.
Acer pictum, var. ?, 380; Sieboldianum, var. ?, 380.
Achnanthes brevipes, 12; longipes, 11.
Achnanthidium arcticum, 11; grœnlandicum, 11.
Achyrophorus grandiflorus, 383.
Acidocroton, 221, 255.
Acidothamnus, 212.
Acidoton, 238, 259.
Acioa, charac. of, 334; guianensis, 333.
Actephila, 208, 263.
Actinostemon, 244, 260.
Adelia, 230, 262.
Adenochlæna, 228, 256, 264; indica, 228; silhetensis, 228; zeylanica, 228.
Adenocline, 204, 230, 264, 265.
Adenogyne, 243.
Adenopeltis, 244, 260.
Adenopetalum, 202, 249, 251.
Adenophædra, 229, 231.
Adenoporium, 221, 255.
Adenosacme acuminata, 160; longifolia, 159.
Adenostemma viscosum, 345.
Adiantum pedatum, 389.
Adiscus albicans, 231.
Adonis appenina, var. davurica, 376.
Adoxa moschatellina, 382.
Adriana, 228, 256, 265.
Adrianeæ, 228.
Advantages of syringing plants in a greenhouse, 325.
Æxtoxicon, 217, 261.
Agaricus Bellotianus, 13, 14; campestris, 15; Feildeni, 13, 14; (Tubaria) furfuraceus, 14; ocreatus, 15; (T.) pellucidus, 14; sphærosporus, 13, 14, 16; (Omphalia) umbelliferus, 13; (O.) umbilicatus, 13; (Clitopilus) undatus, 14.
Agirta, 239.
Aglaia, 343.
Agrostis alba, 388.
Agrostistachys, 227, 263.
Agyneia, 209, 254.
Ailanthus glandulosa, 380.
Alania, 408, charac. of, 417; Endlicheri, 417.
Alchornea, 230, 231; pycnogyne, 231.
Alchorneopsis, 232, 257.
Alectoria bicolor, (ftnote) 346, 555; divergens, 352; jubata, var. chalybeiformis, (ftnote) 347, 555; jubata (prolixa), 555; nigricans, 351; ochroleuca, *a.* rigida, 351; sarmentosa, 554; sulcata, (ftnote) 346.
Alectorieii, 394.
Aleurites, 222, 255; moluccana, 222.
Algæ, Arctic Regions, Dr. G. Dickie on, 6; summary of, 12.
——, Lake Nyassa, notes on, 281.
Algernonia, 246, 260.

Allium lineare, 388.
Allman, Prof., on probable migration of Pinguicula grandiflora through agency of Birds, 157.
Alopecurus geniculatus, 388.
Alphandia, 226.
Alsophila Brunoniana, 403.
Alstonia, 283; theæformis, 291.
Amanoa, 207, 208, 260, 261.
Amanoella, 235.
Ambullania (*Miers*), 333.
Amiantanthus, 480.
Amianthium, 411, charac. of, 478; angustifolium, 478, 479; aspericaule, 475; leimanthoides, 480; muscætoxicum, 478; Nuttallii, 481.
Amomum aromaticum, 3; maximum, 3; subulatum, 4.
Ampelideæ, N. China, 381.
Ampelopsis hederacea, disks of, 308; Veitchi, 308.
Amperea, 188.
Amphiproa longa, 11; Nitzschioides, 11.
Amphora affinis, 11; eunotia, 11; lanceolata, 11; Leighsmithiana, 11; ovalis, 282.
Anacystis sp.?, 9.
Anagallis tenella, 158.
Anaibaina, 238, 254.
Ananas Bravo (a kind of Screw-Pine), 34; sylvestris, 34, 38, 55.
Ancrumia, 413, charac. of, 510; cuspidata, 510.
Ancuba japonica (absorp. leaves), 321, 322, 323.
Andrachne, 208, 254.
Androcylium, 409.
Androcymbium, charac. of, 441; Burchellii, 442, 444; Burkei, 442, 444; circinatum, 442, 443; cuspidatum, 442, 444; Dregei, 442, 443; eucomoides, 442, 443, 444; leucanthium, 442, 443; longipes, 442, 445; melanthioides, 442, var. acaule, 442, var. striatum, 442; palæstinum, 442, 445; punctatum, 442, 443, 445; subulatum, 442; volutare, 442, 443.
Androsace filiformis, 384; saxifragifolia, 384.
Anemone altaica, 376; baicalensis, 376; cernua, 376, and var., 376; flaccida, 376; hepatica, 375; (Anemonanthea) Rossii, 376.
Angiosperms, embryo-sac of, 519.
Angostyles, 237, 262.
Angostylidium, 238, 258.
Anguillaria, 409, charac. of, 451; australis, 452; biglandulosa, 452; capensis, 443; densiflora, 452; dioica, 452; Heyneana, 450; indica, 450; monantha, 452; pygmæa, 437; tenella, 437; uniflora, 452.
Anguillarieæ, charac. of, 409.
Anisophyllum, 202, 249, 250; pillulifera, 250; serpens, 250; thymifolia, 250.
Anisotaxis, 221, 225.
Anthericum calyculatum, 486; Gmelinianum, 483; pseudo-asphodelus, 487; subtrigynum, 478.
Anthistiria ciliata, 388.
Anthriscus nemorosa, 382.
Anthonia cinnabarina, var. kermesina, 563.
Anthostema, 188, 201, 203, 248; orig. and geograph. distrib. of, 248.
Anticlea, charac. of, 406, 407, 411, 481; Fremonti, 480; glauca, 482; mexicana, 483; Nuttallii, 481; sibirica, 483; volcanica, 482.
Antidesma, 212, 216, 261, 262, 264.
Aparisthmnium, 231, 257.
Aphyllantheæ, charac. of, 408.
Aphyllanthes, 408; charac. of, 423; juncea, 423; monspeliensis, 423.
Apocynaceæ, 338.
Aporosa, 215, 263.
Arachne, 254.
Aralia spinosa, 382.
Araliaceæ, N. China, 382.
Arctic Expedition, Algæ of, 6; Fungi of, 13; willows found in, 350.
—— Lichens, gen. remarks on collections of, 346; not food of Ovibos, 349; size of species increase with altitude, 349; tables, geograph. distrib. of, 348.
Argithamnia, 227, 262, 266.
Arisæma serratum, var., 387.
Aristolochieæ, N. China, 386.
Arjona belongs to Olacaceæ, 126, charac. of, 129.
—— appressa, 131; linearis, 133; longifolia, 133; patagonica, 130; pusilla, 131; rigida, (ftnote) 129, 132; ruscifolia, 131; tuberosa, (ftnote) 129.
Arnocrinum, 408, charac. of, 415; Drummondii, 415; glabrum, 416; Preissii, 415.
Aroideæ, N. China, 387.
Arthrodactylis, 35; spinosa, 38, 55.
Arthronia phæoboca, 369.
Arthrothamnos, 249.
Aruba (*Aublet*), (ftnote) 149.
Asagrœa caracasana, 476; caricifolia, 477; officinalis, 476; tenuifolia, 477.
Asarum Sieboldii, 386.
Asclepiadeæ, N. China, 384.
Ascobolus furfuraceus, 16.

Asparagaceæ (subord.), 405.
Asparagus davuricus, 387; gibbus, 387; officinalis, 387; schoberoides, 387.
Aspicolia rosulata, 359.
Aspidium craspedosorum, 389; fœniculaceum, 403; fuscipes, 404; sikkimense, 403; tripteron, 390.
Aspidospermum tomentosum, (ftnote) 334.
Asplenium (Athyrium) Filix-fœmina, 389; Finlaysonianum, 404; Hookerianum, 404; macrophyllum, 404.
Astragalus chinensis, 381.
Astrococca, 237, 262.
Atractylis chinensis, 383.
Australia, Carpesium indigenous to, 345.
Australian Lichens (R. Brown's), by Rev. J. M. Crombie, 390.
Avellanita, 220, 261, 262.
Azolla pinnata, 281.

Baccaurea, 216, 263.
Bacometra, 409, charac. of, 446; columellaris, 446.
Bæomyces pygidatus, β. exilis, 558; roseus, 556; rufus, 556, 557, f. rupestris, 557.
Bailey, F. M., Remarks on Carpesium as indigenous to Australia, 345.
Baker, J. G., and S. Le M. Moore on Flora of N. China, 375.
Baker, J. G., Synopsis of Colchicaceæ and aberrant tribes of Liliaceæ, 405; Synopsis of Hypoxidaceæ, 93.
Baker, Sir Samuel, on a Cyprus cedar, 517.
Balfour, Dr. I. B., on the genus Pandanus (Screw-Pines), 33.
Baliospermum, 236, 264.
Baloghia, 225.
Barbaretta, 94.
Barberina, charac. of, 293; antillana, 294; celastrinea, 294; crenata, 294; cubensis, 294; estrellensis, 293; hirsuta, 294; lanceolata, 293; ramentacea, 294; revoluta, 294; rhamnifolia, 293; Spruceana, 295; tetrandra, 293.
Barrotia, 35; altissima, 38, 53; aragoensis, 38; Balansæ, 38, 42; decumbens, 38, (*Ad. Br.*) 44; diodon, 36, 38, 47; Gaudichaudi, 38, (*Ad. Br.*) 63; macrocarpa, 38, 52; monodon, 38, 53; Pancheri, 38, (*Ad. Br.*) 57; sphærocephala, 38; tetrodon, 38, 63.
Bartsia viscosa, 158.
Bassia latifolia, 87.
Bennett, A. W., on Cleistogamic Flowers, chiefly Viola, Oxalis, and Impatiens, 269.
Bentham, G., Notes on Euphorbiaceæ, 185.
Berberideæ, N. China, 377.
Berberis aquifolia, absorp. leaves, 319, 321, 322, 323; chinensis, 377.
Bergera Königii, 342.
Berkeley, Rev. M. J., on Fungi of Arctic exped., 13.
Bernardia, 229, 262; Gardneri, 231.
Betula exalata, 375, 386.
Betulaceæ, N. China, 386.
Bia, 239.
Biatora vernalis, 563.
Biatorella (Sarcogyne) simplex, and forms herpes and strepsodina, 360; (Sporastatia) testudinea, 360.
Biddulphia aurita, 11.
Bignonia capreolata (tendrils), 308; dioica, 309.
Bilimbia hypnophila, 359; verecunda, 359.
Bischofia, 215, 263.
Blachia, 225, 226, 263; calycina, 226; denudata, 226; Pentzii, 226; reflexa, 226; umbellata, 226.
Blastenia atrocyanescens, (ftnote) 350, 360.
Bobua, charac. of, 303; arborea, 305; atroviridus, 304; baptica, 305; cærulescens, 305; cerasifolia, 304; glaucescens, 305; gracilis, 305; japonica, 306; lancifolia, 306; laurina, 303; Lenormandiana, 304; leptostachya, 306; lucida, 305; montana, 305; myrtacea, 306; neriifolia, 306; nitida, 305; oligostachya, 304; prunifolia, 306; rotundifolia, 305; stravadioides, 304; theophrastæfolia, 306; Vieillardi, 305.
Bocquillonia, 231.
Bonania, 242, 260.
Boragineæ, N. China, 384; scorpioid cyme of, 511.
Borago officinalis, exper. absorp., 317.
Borya, 408, charac. of, 413; nitida, 414; septentrionalis, 414.
Boryeæ, charac. of, 408.
Boucerosia (Purisantha), 163, charac. of, 165; incarnata, 166; mamillaris, 165.
Brachybotys paridiformis, 375, 385.
Brachypodium sylvaticum, 388.
Brachystelma caudatum, 169; crispum, 169.
Branch Tubers and Tendrils of Vitis gongylodes, 306.
Breynia, 254, 263.
Bridelia, 207, 208, 261, 263.

Bromelia sylvestris (synom.), 34, 38,55.
Brown, N. E., Stapelieæ of Thunberg's Herbarium, with descriptions of four new genera, 162.
Bryantia, 25; butyrophora, 38, 42; (Lophostigma) oblonga, 38; viscida (*Ad. Br.*), 65.
Bryonia, absorp. dew, 323.
Buellia (Diplotomma) alboatra, 364, 368; anthracina, 368; moriopsis, 364; parasema β. muscorum, (ftnote) 350, 364, var. γ, papillata, 364; stigmatea, (ftnote) 347; vilis, 364.
Bulbochæte parvula, 281.
Bulbocodium, 410, charac. of, 456; atticum, 438; autumnale, 440; Broteri, 441; colchicoides, 441; Eichleri, 439; hastulatum, 439; ruthenicum, 456; trigynum, 438, 439; vaelaricum, 439; vernum, 439, 456, var. versicolor, 456; versicolor, 456.
Bulbospermum javanicum, 505.
Bungali Elachi (Cardamom), 4.
Buræaoia, 214.
Burchardia, 409, charac. of, 448; multiflora, 448; umbellata, 448.
Buxeæ, charac. of, 200, 205; geograph. distrib. of, 252.
Buxus, 204, 205, 214, 252; as an Order by Baillon, 205; sempervirens, absorp. leaf, 322; subcolumnaris, 205.

Calicium chrysocephalum, 556; debile, 556; hyperellum, 556; sphærocephalum, 556; subtile, 556; trachelinum, 556.
Calliguaya, 244.
Callopisma mydaleum, 356.
Caloplaca celata, 356; cernia, 356; citrina, 356; elegans, 369, β tenuis, (ftnote) 350, 356, β typica, 355; ferruginea β nigricans, 357; jungermanniæ, (ftnote) 350, 357; pyracea, 356; subsimilis, 357; vitellina, 357.
Caltha palustris, 376.
Calycopeplus, 188, 201, 203, 248.
Calystegia acetosellifolia, 384.
Campanula hederacea, 158; punctata, 384.
Campanulaceæ, N. China, 384.
Campsoa maculata, 464.
Cantharellus musigenus, 15.
Capellania, 235.
Caperonia, 227, 260, 262.
Caprifoliaceæ, N. China, 383.
Capsella Bursa Pastoris, 378.
Cardamine macrophylla, 378.
Cardamoms of Nepal, 3; Roxburgh on, 4.
Carduus, absorp. dew, 323.
Carex breviculmis, 388; clandestina, 389; digitata, 389; falcata, 389; heterostachya, 389; japonica, 389; notha, 389; pediformis, 388; pisiformis, 389; stenophylla, 381.
Carisseæ, tribe of, 338.
Carpesium cernuum ?, 345.
Carumbium, 240.
Caryodendron, 231, 262.
Caryophylleæ, N. China, 380.
Cedar of Lebanon, var. of in Cyprus, Sir J. D. Hooker on, 517.
Cedrus deodara, absorp. leaf, 322; Libani, var. brevifolia, 518; peculiarities in geograph. distrib. of, 519.
Celastrineæ, 206; of N. China, 380.
Celtis sinensis, 386.
Cenomyce digitata, var. monstrosa, 560; pleurota, 557.
Centaurea, fragment N. China, (ftnote) 375.
Centrodiscus, 231.
Cephalocroton, 228, 231, 256, 264.
Cephalomappa, 235, 264.
Ceratophyllum sp. ?, 281.
Cercospora gnaphaliacea, 142.
Cериscoides, 311.
Cervantesia, charac. of, 78; bicolor, 80; Kunthiana, 81; tomentosa, 79.
Cervantesieæ, charac. of tribe, 78.
Cervantesieæ and Schœpfieæ, J. Miers on, 68.
Cetraria aculeata, 562, f. acanthella, 561, var. hispida, 561; Delisei fastigiata, 558; Fahlunensis, 353; hiascens, 352; islandica, 352, 575, f. dilatata, 575, var. crispa, 575; nivalis, 347, (ftnote) 350, 352.
Chætocarpus, 235, 258.
Chætoceros borealis, 11; decipiens, 11.
Chætomium glabrum, 13, 16.
Chætomorpha melagonium, 7.
Chætopteris plumosa, 7, 10.
'Challenger' Lichens, Remarks on Mr. Crombie's paper on, 152.
Chamælirium, 411; carolinianum, 468; luteum, 468, 469.
Chasseloupia arborea, 305; cærulescens, 305; gracilis, 305; lucida, 305; montana, 305; neo-caledonica, 305; nitida, 305; tinctoria, 305.
Cheilanthus argentea, 389.
Cheilosoa, 235, 264.
Cheilosopsis, 225.
Chelidonium majus, 378.
Chenopodiaceæ, N. China, 385.

China, Northern, Messrs. Baker and Moore on Flora of, 375.
Chionographis, charac. of, 406, 410, 469; japonica, 469.
Chironyphe Carteri, fructification of, (ftnote) 181.
Chittim Wood, Sir S. Baker on, 517.
Chloopsis acaulis, 501; caulescens, 501.
Chloradenia, 231, 264.
Chloranthaceæ, N. China, 386.
Chloranthus japonicus, 386.
Chlorea canariensis, 556.
Chlorophyll, increase of, in meat-fed plants, 23.
Chordaria flagelliformis, 7.
Chordariaceæ, 7.
Choriceras, 213.
Choriophyllum, 214, 263.
Chroococcus turgidus, 9.
Chrozophora, 227, 263, 265.
Chrozophoreæ, 224.
Chrysobalanus Icaco, 337.
Chrysosplenium flagelliferum, 382; pilosum, 382; sphærospermum, 382; sp. nov.?, N. China, 382.
Chthonoblastus sp.?, 8.
Cicca, 210, 253.
Ciponima, 283, charac. of, 288; guianensis, 288; scabridula, 288.
Cirsium segetum, 383.
Cladia aggregata, 561.
Cladina amaurocræa, var. cladonioides, 558; rangiferina, 561; sylvatica, 561, f. alpestris, 561; uncialis, 560, var. adunca, 568, var. attenuata, 560, f. obtusata, 561.
Cladodes, 231, 257.
Cladogyne, 235, 264.
Cladonia acuminata, 392; adspersa, 393; aggregata, 393; alcicornis, 558; bacillaris, 559; bellidiflora, 559, f. vestita, 559; cariosa, 556; cervicornis, 558, var. cladomorpha, 558; coccifera, 352, 557; coccifera, f. extensa, 557, var. asotea, 557, f. epiphylla, 557; cornuta, 559; cormybosulum, 560; crispata, 560, f. cetrariæformis, 558, f. obtusata, 560, f. ventricosa, 560; decortica, 559; deformis, 393, 559; degenerans, var. anomæa, 560; delicata, 556; Dilleniana, 560; fimbriata, f. denticulata, 559, f. exilis, 558; nemoxyna, 559, f. radiata, 559, f. simplex, 557, f. tubæformis, 558; furcata, var. racemosa, f. spinosa, 561, var. recurva, 561, f. subcrispata, 558; subulata, 561, f. truncata, 577; gracilis, cornuta, 559, f. chordalis, 558, (hybrida), 558, 560; macilenta, 558, 559, f. clavata, 559, f. filiformis, 558; f. polydactyla, 559; megaphylla, 558; pityrea, 560, f. scabridula, 560; pleurota, 557; pulverulenta, 392; pungens, 561, f. foliacea, 561; pyxidata, 557, f. prolifera, 557, β pocillum, 352; racemosa, 577; rangifera, 349; retepora, 393; sobolifera, 557; squamosa, 559, f. cucullata, 558; subcornuta, 559; subsquamosa, 560; sylvatica, 393; urticellaris, 557, 560.
Cladonei, 392.
Claoxylon, 209, 264, 266.
Clarke, C. B., Note on Gardenia turgida, 310; on Ferns of North India, 402; on two kinds of Dimorphism in the Rubiaceæ, 159.
Claussena Willdenovii, 342.
Cleidion, 257, 234; tricoccum, 258, ulmifolium, 257; verticillatum, 258.
Cleistanthus, 207, 208, 261.
Cleistogamic Flowers, notes on, 269, general remarks on, 278.
Clematis paniculata, 375.
Clinostylis speciosa, 458.
Closterium lunula, 8.
Cluytia, 227, 263, 265.
Cluytiandra, 209, 254.
Cnesmone, 188, 239, 259.
Cnidoscolus, 221, 255.
Coccocarpia plumbea, 571.
Coccoceras, 233, 264.
Cocconeis arctica, 11; costata, 11; glacialis, 11; placentula, 282; scutellum, 11.
Cocconema cistula, 282; cymbiforme, 282.
Cocconerion, 235.
Cochin China, Restiaceous plant in, 343.
Codiæum, 225, 263; andamanicum, 226.
Cœlebogyne, 231, 257, 265.
Cœlodepas, 231, 264.
Cœlodiscus, 232, 264.
Cœnogonium implexum, 399.
Coffee, Table, production of, in Ceylon, 173.
Coffee-Leaf Disease, D. Morris on, 512; Rev. R. Abbay on, 173; conditions of growth, 182, 515; dark body beneath sporanges, Abbay on, 179, Morris on, 515; effects of, commercially, 513; general descrip. of, 175, 513; germination of spores, 180, 514; historical remarks on, by Rev. R. Abbay, 173, and D. Morris, 512; microsc. exam. of dry specimens of,

176; mycelium of, 177, 515; nature of, 513; nature of sporanges and spores, 177, 179, 515; remedies, 183, 516.
Colchicaceæ, a synopsis of, 405; charac. of, 408, 423; geograph. distrib. of, 407; introductory remarks on, 405; tribes and genera of, 408.
Colchicum, 409, charac. of, 423; ægypticum, 433; æstivale, 428; ætnense, 431; agrippinum, 424, 425; alpinum, 425, 432; amabile, 424, 426; arenarium, 425, 432; atticum, 438; autumnale, 424, 428, var. pannonicum, 429; Balansæ, 429; Bertolonii, 433; Bivonæ, 424, 426; Boissieri, 434; byzantinum, 424, 428; bulbocodiodes, 433, 441; candidum, 429; castrense, 431; caucasicum, 438; chionense, 425; corsicum, 425, 431; crociflorum, 428, 433; cupani, 433; eubœum, 434; fasciculare, 433; fritillaricum chiense, 425; Haynaldi, 431; hermodactylum, 433; hexapetalum, 441; hololophum, 433; illyricum, 428; Jankæ, 431; Kochii, 431; Kotschyi, 429; lætum, 424, 429; latifolium, 427; Levieri, 424, 427; lingulatum, 425, 432; lusitanum, 424, 426; luteum, 425, 434; montanum, 425, 432, 440; multiflorum, 429; neapolitanum, 425, 431; nivale, 433; orientale, 431; Parlatoris, 434; parnassicum, 425, 431; parviflorum, 433; parvulum, var., 432; patens, 429; persicum, 424, 430; polyanthos, 429; polymorphum, 434; polyphyllum, 424, 430; provinciale, 431; pulchrum, 424, 425; pusillum, 433; Ritchii, 433; Sibthorpii, 424, 427; speciosum, 424, 428; Steveni, 425, 433; Todarii, 427; Tenorii, 424, 427; transsilvanicum, 428; trapezunticum, 430; triphyllum, 433; Troodi, 424, 430; turcicum, 424, 429; umbrosum, 424, 430; Valery, 433; variegatum, 424, 425; variopictum, 424, 427; vernum, 429; zoritsii, 425, 434.
Collema auriculatum, 566; cheileum, 566; dermatinum, 566; crispum, var. ceranoides, 566; fasciculare, 566; flaccidum, 565; furvum, 566, f. tunæforme, 566; glaucophthalmum, 391; implicatum, 391; leucocarpum, 391; melænum, f. marginale, 566; nigrescens, 39, 565; pulposum, 367, 566; tenax, 566.
Collemacei, 391.
Collemei, 391.
Colmeiroa, 212.
Cometia, 216.
Compositæ, N. China, 383.
Conanthera, 412, charac. of, 493; bifolia, 493, 494; campanulata, 494.
Conanthereæ, 405, 407, 412.
Conceveiba, 232, 262; africana, 232; guyanensis, 232; Hostmanni, 232; latifolia, 232; Martiana, 232; megalophylla, 232; terminalis, 232.
Conferva sp. ?, 281.
Confervaceæ, 7.
Conida clemens, 369; fusca, 369.
Conifera of N. China, 389.
Conifers, relations between Morphology and Physiology of, Dr. M. T. Masters on, 547.
Conosapium, 242.
Contribution to the Flora of N. China, by J. G. Baker and S. Le M. Moore, 375.
Contributions to our knowledge of the embryo-sac in Angiosperms, by H. Marshall-Ward, 519.
Convallaria japonica, 501, var. major, 502, var. minor, 501; majalis, 387; spicata, 499.
Convolvulaceæ, N. China, 384.
Convolvulus arvensis, 384.
Cooke, M. C., the Fungi of Texas, 141.
Cornicularia lanata, 562.
Corticium carneum, 141; cinereum, 141.
Corydalis aurea, 378; remota, 378, and var. leneariloba, 378; solida β rotundiloba, 378, α typica, 378.
Corylus avellana (absorp. leaves), 318, 322, 387.
Coscinodiscus centralis, 11; excentricus, 11, 12; radiatus, 11; subtilis, 11, 12.
Cosmarium margaritiferum, 281.
Couepia, charac. of, 334; Uiti (*Benth.*), 334.
Crassulaceæ, N. China, 382.
Cratægus pinnatifida, 382.
Cremophyllum, 259.
Crescentia, 341; fruit of, 338.
Crocus, 95.
Crombie, Rev. J. M., on Australian Lichens of R. Brown in Brit. Mus., 390; on Lichens of Dillenius's 'Historia Muscorum,' 553; Remarks on paper of, 152.
Crotogyne, 227, 263.
Croton, 256; lobatus, 260.
Crotoneæ, charac. of, 200, 206, 219; geograph. distrib. of, 253.
Crotonopsis, 223, 256.

Crucifera, N. China, 378.
Ctenomeria, 239.
Cumingia, 412, charac. of, 495; campanulata, 494; parvula, 494; tenella, 494; trimaculata, 494.
Cunuria, 220, 262.
Cupulifera, N. China, 387.
Curcas, 221, 255.
Curculigo, 95, 98, charac. of, 122; gallabatensis, 123, var. major, 123; latifolia, 125, var. villosa, 125; orchioides, 124; plicata, 122, var. Barberi, 123; scorzoneræfolia, 124; seychellensis, 95, 124; veratrifolia, 123.
Cuttings, making of, 327.
Cyanella, 412, charac. of, 496; alba, 497; cærulea, 498; capensis, 497, 498; lineata, 491; lutea, 498, var. rosea, 498; odoratissima, 498; orchidiformis, 497; rosea, 498.
Cyathogyne, 217, 263.
Cyclostemon, 213, 261.
Cyclotella operculata, 282; rotula, 282.
Cylindrophora, 238, 258.
Cylindrospermum nyassæ, 282.
Cymbanthes fœtida, 444.
Cymbella maculata, 11.
Cymation lævigatum, 449.
Cyme, Scorpioid, origin of, 511; errors in deducing scorpioid from dichotomous, 511.
Cyperaceæ, N. China, 388.
Cyphella convoluta, 141.
Cypress, two vars. of in Cyprus, Sir S. Baker on, 518.
Cyprus Cedar, Sir J. D. Hooker and Sir S. Baker on, 517.

Dactylostemon, 244; verticillatus, 244.
Dahlia, absorp. leaf, 319.
Dalechampea, 239, 258, 259; micrantha, 239; scandens, 260.
Dalembertia, 188, 244, 260.
Daphniphyllum, 204, 216, 263.
Darwin, F., on Experiments on Nutrition of Drosera rotundifolia, 17, 32; manner of conducting experiments, 21; tables of experiments, 22, 24, 25, 26, 27, 28, 29, 31; food-given plants experimented on, 23; effect of nitrogenous food, 24.
Davallia dareæformis, 403; Wilfordii, 389.
Decadia, charac. of, 295; aluminosa, 295; racemosa, 299.
Denticula frigida, 11.
Desmarestia aculeata, 6.
Desmidieæ, 8.
Deutzia grandiflora, 382.
Dew, absorption of, by green part of plants, 313, 323; absorption of imitation dew, 323.
Diacalpe fœniculacea, 403.
Diadesmis confervacea, 282.
Dianella, 407.
Diatoma elongatum, 11.
Diatomaceæ, Arctic regions, 9, 11; Dr. G. Dickie on, 12; of Lake Nyassa, 282; P. T. Cleve on, 12.
Diatrype bullata, 563; exutans, 143; opaca, 143; rumpens, 143.
Dicælia, 217, 263.
Dicalix, charac. of, 296; cochinchinensis, 296.
Dicentra spectabilis, 378.
Dichæna rugosa, 563.
Dickie, Prof. G., on Algæ from Lake Nyassa, E. Africa, 281; on Algæ of Arctic Exped., 6.
Dicliptera, 290; bivalvis, 290.
Dicolus cærulescens, 495.
Dictamnus fraxinella, 380.
Dictyolaceæ, 7.
Dictyosiphon fœniculaceus, 7.
Diervilla versicolor, 383.
Digitalis purpurea, absorp. leaf, 320.
Dillenius's Lichens, Rev. J. M. Crombie on, 553.
Dimorphanthera, 234.
Dimorphism, two kinds of, in the Rubiaceæ, 159.
Dimorphocalyx, 226, 263.
Dionæa, trap of, 17.
Dipidax, 409, charac. of, 446; ciliata, 447, var. Garnotianum, 447; rosea, 447; triquetra, 447.
Diplasium longifolium, 403.
Diplochlamys, 233.
Diplocyatha (*n. gen.*), charac. of, 167; ciliata, 168.
Dipterocarpeæ, 289.
Discella leguminum, 142; angulata, 142.
Disks, adhesive, of Ampelopsis hederacea, 309; Hoploplium, 308; Peponopsis adhærens, 309; Vitis gongylodes, 309; Vitis tricuspidata, 308.
Disocarpus, 208, 261.
Disporum smilacinum, 387.
Dissiliaria, 213, 265; tricornis, 213.
Distrepta vaginata, 496.
Ditrysinia, 243.
Ditta, 242, 260.
Dodecastemon, 213.
Dontostemon dentatus, 378.
Doornia, 35; reflexa, 38, 60.
Dorystigma, 35; madagascariense, 38, 52; mauritianum (*Gaud.*), 38, 44, 52.

Dothidea bullulata, 17; ilicis, 144.
Draba nemorosa, 378.
Dracæna ellipticæ, 502; graminifolia, 499.
Dracocephalum sinense, 385; urticifolium, 385.
Drosera, exper. nutrit. of, 17; rotundifolia, 17, 31, 278; additional memorandum on, 32; capsules in meat-fed plants, 26, 28; flower-stems in meat-fed plants, 25, 27; leaves in meat-fed plants, 25; seeds in meat-fed plants, 28, 29, 30; starch formed in, 30; weight of meat-fed plants, 31.
Drupatris, charac. of, 295; cochinchinensis, 296.
Drypetes, 213, 261.
Duvallia polita, 171; repens, 403.
Dyer, W. T. Thiselton, on fruiting of Wistaria sinensis, 329.
Dysopsis, 204, 251.

Echinospermum Lappula, 384.
Ectocarpaceæ, 7.
Ectocarpus siliculosus, 7; viridis, 7.
Egg-apparatus in Butomus, 526, 536; in Myosurus, 530; in Ranunculus repens, 530.
Elæococca, 222.
Elateria, 256.
Elateriospermum, 220.
Elymus dasystachus, 388.
Emblica, 210, 254.
Emblicastrum, 211, 254.
Embryo-sac in Angiosperms, H. M. Ward on, 519; of Agrimonia, 537; of Alisma plantago, 528, 543; of Allium, compared, 535; of Anemone japonica, 529, 543; of Anthemis tinctoria, 534, 545; of Anthericum compared, 535; of Butomus umbellatus, 520, 541; of Gymnadenia compared, 537; of Lobelia syphilitica, 535, 546; of Lupinus venustus, 531, 544; of Myosurus, 537; of Œnothera biennis, 532, 544; of Orchis pallens compared, 535; of Pisum, 537; of Pyrethrum balsaminatum, 532, 544; of Ranunculus, 537; of Rosa compared, 524, 531; of Rosa livida, 531; of Senecio compared, 532; of Verbascum phlomoides, 536, 546, phœniceum, (ftnote) 537; on method of preparation of microscop. sp., (ftnote) 519; postscript on, 540; preliminary remarks on, 519; suggestions concerning, by H. M. Ward, 537; Vesque's descrip. of, in Butomus, 527; Ward's theory concerning, 539.
Encyonema prostratum, 282.
Endococcus perpusillus, (ftnote) 350, 369; triphractus, 369.
Endocarpiscum aterrimum, 153.
Endocarpon fluviatile, 576; Hedwigii, 576; miniatum, 576, var. complicatum, 576.
Endospermum, 235, 264.
English Polar Exped. 1875–76, Lichens of, by Prof. Fries, 346.
Enteromorpha clathrata, 7, 9.
Enum. Australian Lichens in Herb. Rob. Brown (Brit. Mus.), with descrip. of new sp., by the Rev. J. M. Crombie, 390.
—— Fungi coll. in Arctic Exped., Rev. M. J. Berkeley on, 13.
Ephebacei, 391.
Ephebe pubescens, 391, 555; tasmanica, 391.
Ephebei, 391.
Epidermis, herbaceous internodes, absorption of water by, 316.
Epiphegus virginiana, 280.
Epimedium violaceum, 377; macranthum, 377.
Epiprinus, 236, 264.
Epithemia alpestris, 282; clavata, 282; sorex, 282; turgida, 282; ventricosa, 282; zebra, 282.
Equisetaceæ, N. China, 389.
Equisetum arvense, 389.
Eraclissa, 254.
Eranthis stellata?, 376.
Eremocarpus, 223, 256.
Eremophyton, 202, 249; cremophylla, 249.
Ericaceæ, N. China, 384.
Erinna, 413, charac. of, 510; gilliesioides, 510.
Eriococcus, 111.
Erismanthus, 236, 264.
Erythrococca, 119.
Erythrostictus europæus, 445; gramineus, 445; palæstinus, 445; punctatus, 445.
Eualchornea, 231, 257, 260.
Euasplenium longifolium, 403.
Eucodiæum, 225.
Eucrotoneæ, 222.
Eucurculigo, 95.
Eu-Gardenia, 310.
Euhippomaneæ, 240.
Euhypoxis, 95, charac. of, 99.
Eulalia densa, 388.
Eumacaranga, 234.
Eunonymus Bungeanus, 380; Thunbergianus, 380, and var., 380.
Eunotia arcus, 11; diodon, 11; tridentula, 282.
Euphorbia, 248; cæcorum, 203; cre-

mophila, 249; esula, 386; insulana, 203; pilulifera, 260; sections of, 201; serpens, 260; thymifolia, 260.
Euphorbiaceæ, N. China, 386.
——, Notes on by G. Bentham, 185; affinities of, 199; American gen. 261, 266; arrang. adop. by G. Bentham, 200; Asian gen., 265; Australian gen., 265; characters, diff. value of, remarks on, 188; confused state of, remarks on, 185; gen. common to Old and New World, 253; gen. peculiar to continents, 261; historical *résumé* literature of, 186; limits of the order, 200; Madagascar gen., 266; nomenclature of, and subject generally, 189; Old-World gen., 262, 266; order cannot well be broken up, 199; origin and geograph. distrib. of, 246; palæontological bearings, 246; tropical origin of, 247; representative gen. in New and Old World, 261; systematic arrangement, 199.
Euphorbieæ, charac. of, 200, 201; geograph. distrib. of gen., 248.
Euphorbium, 202, 249.
Euphyllanthus, 211, 253.
Euplukenetia, 237, 258.
Eusebastiania, 243.
Eutragia, 238.
Eutrigonostemon, 224.
Eutropia, 256.
Evernia divaricata, 544, 569; furfuracea, 569; lacunosa, 566; prunastri, 569, var. arenaria, 569, var. gracilis, 569, f. retusa, 569.
Excœcarieæ, 188, 240, 242, 259; agallocha, 243; africana, 243; melanosticta, 243; polyandria, 243; reticulata, 243.
Exiteles corymbosa, 336.
Exochorda serratifolia, 375, 381.
Expedition, Arctic, Algæ of, 6.
Experiments on Nutrition of Drosera rotundifolia, F. Darwin on, 17.
Eydouxia, 35; macrocarpa, 38, 46; Delessertii, 38, 55.

Fagus, absorp. dew, 323.
Fahrenheitia, 225.
Falconeria, 242.
Feilden, Capt., Coll. of Arctic Lichens, 348.
Ferns of North China, 389; of North India, by C. B. Clarke, 402; change names of, 403; habitats, remarks on, 404; remarks on Wallich's collection, 404.
Fertilization of Meyenia erecta, 145.
Ficus carica, absorp. leaf, 321.
Fisquetia, 35; macrocarpa, 39, 47; militaris, 39, 53; ornata, 39, 57; ovata, 39, 57.
Flora of N. China, Messrs. Baker and Moore on, 375.
Flowers, on preservation of cut, 326.
Fluggea, 208, 212, 254, 407, 413, 263, charac. of, 500; dracænoides, 501, 502; dubia, 501; Griffithii, 501, 502; Jaburan, 501, 502; Jacquemontia, 501; japonica, 501, var. intermedia, 501, var. umbraticola, 501, var. Wallichiana, 501; ? prolifera, 502; spicata, 500.
Folium baggea maritimum (*Rumph.*), 39, 45.
—— —— verum (*Rumph.*), 39, 45.
Fontainea, 226.
Forbesia, 95.
Fouha bulbocodioides, 433.
Fouillioya, 35; graminifolia, 39, 59; maritima, 39; racemosa, 39, 60.
Fragariopsis, 238, 258.
Fragilaria oceanica, 11; striatula, 11; undata, 282.
Freycinetia demissa (*Br. & Benn.*), 45; graminea (*Bl.*), 48; nitida (*Miq.*), 62.
Fries, Prof. T. M., on Lichens of Polar Exped. 1875–76, 356.
Fritillaria japonica, 463.
Fumariaceæ, N. China, 378.
Fungi of Arctic Exped., Prof. Dickie on, 13; of Texas, M. C. Cooke on, 141.

Gagea lutea, 388.
Galearia, 218, 263.
Galearieæ, charac. of, 201, 207, 218; geograph. distrib. of, 253.
Galium aparine, 383.
Garcia, 222, 262.
Gardenia, note on, by C. B. Clarke, 310; Blumeana, 312; campanulata, 311, 312; erythroclada, 161; latifolia, 310; lucida, 310; montana, 311, 312; sessiliflora, 161; speciosa, 310; tubifera, 310; turgida, 310, 311.
Gavarretia, 232, 262.
Gebera anandria, 383.
Geblera, 212.
Gelfuga, 212.
Geloniastrum, 225.
Gelonieæ, 235.
Gelonium, 236, 264.
Gentiana Thunbergii, 384.
Gentianeæ, N. China, 384.
Geophila pyrenaica, 441.
Geranium, absorp. dew by, 323.
Germination of Pachira aquatica, 147.

Gethyum, 413, charac. of, 508; atropurpureum, 509.
Geum strictum, 381.
Gilliesia, 413, charac. of, 507; gaudichaudiana, 507, 508; graminea, 507, 508; montana, 507, 508.
Gilliesieæ, 405, 407, 412, 506.
Givotia, 224, 263.
Glochidion, 210, 253, 254.
Glœocapsa magma, 9.
Gloriosa, 410, charac. of 457; abyssinica, 457, 458; angulata, 457; cærulea, 458; Doniana, 457; superba, 457, var. angustifolia, 458; virescens, 457, 458, var. grandiflora, 458.
Glycine sinensis, C. de Candolle, note on, 330.
Glycosmis, 342.
Gomphonema dichotomum, 282; intricatum, 282; naviculoides, 282; turris, 282.
Gonatogyne, 209.
Goniophlebium erythrocarpon, 403.
Gramineæ, N. China, 388.
Grammatophora arctica, 11; islandica, 11.
Graphidiei, 401.
Graphis intricata, 401; scripta, 563, f. divaricata, 563; sophistica, 40.
Griffonia, fruit of, 337.
Gussonia, 243.
Gyalecta peziza, 367.
Gymnanthes, 243, 260; polyandra, 243.
Gymnostillingia, 241.
Gyrophora anthracina, (ftnote) 347; arctica, 576; cylindrica, 354, 397, 575, β from 83° 6′ N. lat., 348, f. denticulata, 575, β simplex, 354; discolor, (ftnote) 350, 355; erosa, 355, f. torrefacta, 576; grisea, 575; hypoborea, β arctica, 347, 355; Koldeweyi, 355; polyphylla, 576; polyrrhiza, 576; proboscidea, 355, 397; rugifera, 355; vellea, 577.

Hanburya mexicana, 309.
Hart, Mr., Coll. of Arctic Lichens, 348.
Hartog, Marcus M., Morph. notes on species of Thunbergia, 1.
Hasskarlia (synom. Pandanus), 35, 229, 264; globosa, 39, 64; leucantha, 39, 55.
Hebelia allemanica, 487; collina, 487.
Hedera helix, absorp. leaf, 321, 322.
Hedraiostyles, 238.
Hedycarpus, 216.
Helonias, 411, charac. of, 467; angustifolia, 479, 481; asphodeloides, 467; borealis, 487; bracteata, 482; bullata, 468; dioica, 468; dubia, 477; edentatum, 457; erythrosperma, 478; glaberrima, 482; graminea, 484; japonica, 469; læta, 478, var. minor, 479; latifolia, 468; lutea, 468; nigra, 472; officinalis, 476; paniculata, 481; pumila, 468; virescens, 483; virginica, 475; viridis, 471.
Heloniеæ, charac. of, 410.
Heloniopsis, 410, charac. of, 459; breviscapa, 459; grandiflora, 460; japonica, 459; pauciflora, 460; umbellata, 460.
Helvella californica, 402; crispa, 402.
Hemetelia Brunoniana, 403.
Hemicyclia, 213.
Hemileia vastatrix, Coffee-leaf disease, Rev. R. Abbay on, 173, and D. Morris on, 512; conditions of growth, &c., 182; differences of Ceylon and Sumatra forms, 182; historical notice of, 173, 512; sporanges, nature of, 177, 514.
Hemiptelea Davidii, 386.
Hemistepta lyrata, 383.
Hendersonia magna, 142.
Henophyton and Oudneya identical, 329.
Henophyton deserti, 328.
Henslow, Rev. G., on absorption of Rain and Dew by Green Parts of Plants, 313; on Origin of so-called Scorpioid Cyme, 511.
Hesperis nitens, 328.
Heterostigma, 35; Heudelotianum, 39, 49.
Hevea, 220, 255, 262.
Hewardia, charac. of, 406, 410, 460; tasmanica, 461.
Hierochloa borealis, 388.
Hieronyma, 216, 261.
Himontidium pectinale, 282.
Hippomane, 241, 260.
Hippomaneæ, 239.
Hirtella Gardneri, 337; hebeclada (fruit of), 337; triandra, 337.
'Historia Muscorum' of Dillenius, Lichens of, Rev. J. M. Crombie on, 553.
Holoptelea?, N. China, (ftnote) 375.
Homalanthus, 240, 260.
Hombronia, 35; calathiphora, 39, 42; edulis, 39, 45.
Homodium holacinum, 573.
Homonoia, 235, 264.
Hooker, Sir J. D., on a Cyprus Cedar, 517.
Hopea, 283, 289; dichotoma, 290; tinctoria, 290.
Hordeum murinum, 280.
Hormosiphon arcticum, 9.
Hormospora, sp.?, 9.

Huerniopsis (n. gen.), charac. of, 171; decipiens, 171.
Hura, 245, 260; crepitans, 261.
Hyacinthus, absorp. dew, 323.
Hyænancha, 214.
Hydrocharis Morsus-ranæ, 345.
Hygrophorus miniatus, 15; virgineus, 15.
Hymenocardia, 217, 263.
Hypheothrix coriacea, 8; obscura, 8; vulpina, 8.
Hypoxidaceæ, a synopsis of, 93; classification of, 94; fruit of, 97; general characters of, 97; general remarks on, 93; geograph. distrib. of, 93, 97; inflorescence of, 96; key to genera, 98; leaves of, 95; perianth of, 96; pistil of, 96; pubescence of, 95; root-stock of, 95; stamens of, 96.
Hypoxidopsis pumila, 126, 450.
Hypoxis, 95, 98; alba, 99, 102, var. Burkei, 102, var. gracilis, 102; Andrewsii, 99, 104; angolensis, 100, 106; angustifolia, 100, 111, var. Buchanani, 100, 111; argentea, 100, 110; Arnottii, 102, 112; aquatica, 99, 102; aurea, 100, 108; Baurii, 100, 105; canaliculata, 100, 109; charac. of, 99; costata, 100, 119; cuanzensis, 100, 111; decumbens, 100, 107; erecta, 100, 106; fascicularis, 126, 433; filiformis, 100, 109; Gerrardi, 100, 110; glabella, 99, 104; graminea, 100, 109; hemerocallidea, 100, 119; hygrometrica, 100, 107, var. elongata, 108, var. pratensis, 108; iridifolia, 100, 117; Jacquini, 100, 112; juncea, 100, 106, var. Wrightii, 106; latifolia, 100, 105; longifolia, 100, 115, var. Thunbergii, 116; Kraussiana, 100, 109; Ludwigii, 100, 116; marginata, 100, 108; membranacea, 100, 106; microsperma, 100, 117; milloides, 100, 105; minuta, 99, 101; monanthos, 100, 108; multiceps, 100, 117; occidentalis, 99, 104; obtusa, 100, 114; ovata, 99, 103; parvula, 100, 113; platypetala, 100, 105; polystachya, 100, 105, var. andongensis, 115; pusilla, 99, 104; ramosa, 126; rigidula, 100, 116, var. pilosissima, 117; Rooperi, 100, 118, var. Forbesii, 118; Schimperi, 100, 110; Schnitzleinia, 126; sericea, 100, 111, var. Dregei, 112, var. flaccida, 112; serrata, 99, 103; setosa, 100, 113; spicata, 126; stellata, 99, 101, var. albiflora, 101, var. elegans, 101, var. Gawleri, 101, var. linearis, 101; stellipilis, 100, 118; tab. charac. species of, 99; villosa, 100, 113, var. canescens, 114, var. obliqua, 114, var. pannosa, 114, var. recurva, 114, var. scabra, 114, var. sobolifera, 114, var. Zeyheri, 100, 112.
Hypoxylon fuscum, 563.
Hysterium medium, 143.

Ianthe, 95, 99.
Ilex, aquifolia, absorp. leaf, 322.
Impatiens, cleistogamic flowers of, 276; fulva, 276, 277; glandulifera, 278; noli-me-tangere, 269, 276; parviflora, 277.
India, Ferns of North, 402.
Indigofera macrostachya, 381.
Internodes, absorption by, 316, 319; nourishment of plants by, 324.
Iodina, charac. of genus, 83; cuneifolia, 84; rhombifolia, 85.
Iphigenia, 409, charac. of, 450; caricinum, 451; guineense, 450, 451; indica, 450; novæ-zelandiæ, 450, 451; pallida, 450, 451; racemosa, 450.
Ipomæa purpurea, absorp. leaf of, 319.
Irideæ, N. China, 387.
Iris ensata, 387; Rossii, 387; ruthenica, 387.
Isidrogalvia falcata, 489; Moritziana, 489.

Jania Breyniana, 446.
Jatropha, 220, 255, 256; curcas, 255, 261; Wightiana, 255.
Jatropheæ, charac. of, 220.
Jeanneretia, 35; littoralis, 39.
Jeffersonia dubia, 377.
Joannesia, 220, 262.
Johnsonia, 408, charac. of, 417; acaulis, 419, var. Drummondii, 419; hirta, var., 419; longifolia, 419; lupulina, 418; mucronata, 419; pubescens, 418; teretifolia, 418.
Julocroton, 223, 256.
Juncus bufonius, 280.

Kaida taddi (*Reede*), 39; Tsjerria (*Reede*), 39, 47.
Keura, 35; odorifera, 39, (*Fostr.*) 55.
Kigelea, 341; æthiopica (*Decaisne*), 340, 341; pinnata, *DC.*, 340.
King, Dr. G., on winged Cardamom of Nepal, 3.
Kirganelia, 210, 254.
Kolbea Breyniana, 446.
Kreysigia, 410, charac. of, 465; multiflora, 465.

Labiatæ, N. China, 385.
Lachnostylis, 208, 261.

Lactuca (Ixeris) ramosissima, 384; versicolor, 383.
Lagarosiphon muscoides ?, 281.
Lagerstrœmia, phyllotaxis of, 511.
Laminaria caperata, 6; longicruris, 6.
Laminariaceæ, 6.
Lamium amplexicaule, 280; petiolatum, 385.
Lampra, (ftnote) 454.
Lasiocroton, 232, 262.
Lassia, 239.
Lastræa sikkimensis, 403.
Lathræa squammaria, inflorescence of, 511.
Lathyrus palustris, var., 381.
Laubach, Count Sohlms, his 'Monographia Pandanacearum,' 67.
Lautembergia, 231, 257.
Lawia, 160.
Laxmannia, 468, charac. of, 420; brachyphylla, 420, 421; gracilis, 420, 422; grandiflora, 420, var. paleacea, 421; illecebrosa, 422; minor, 420, 422; pauciflora, 421; ramosa, 420, 422; Roei, 422; sessiliflora, 420, 422, var. congesta, 423; sessilis, 420, 421; squarrosa, 420, 421.
Leaves, absorption by, attached to branches, 318; absorption by detached, 321; assimilation, 550; exhalation, 550; internal structure of, in Conifers, 548; movements of, 549; nourishment of one part by absorption in another, 319; nourishment of Plants by, 324; of Spruces, structure of, 548; palisade cells of, 549; power of nourishing the rest of, on the shoot, 318; resin-canals, 549; respiration, 550.
Lecanora albella, 564; albescens, 358, var. cassioalba, 359; atra, 564; atrosulphurea, 358; calcarea, 359; candelaria, 565; (Placodium) chrysoleuca, β melanophthalma, 358; chlaronella, 154; chlaroterodes, 154; citrina, 565; cyanochroa, 155; cypellioides, 156; cyphelliformis, 156; dispersa, 359; elegans, 57; endoleuca, 155; ferruginea, 399, 563, 564; flavida, 359; fruticulosa, 562; (Placodium) fulgens, β alpina, 358; galactina, 564; gibbosa, (ftnote) 350, var. β squamata, 359; glaucoma, 564; Hageni, (ftnote) 350, 358, var. roscida, 358; pallescens, 358; parella, 564; punicea, 399; subfusca, 358, 564, var. iodocarpa, 564, var. hypnorum, 358; tartarea, 564; varia, β polytropa, (ftnote) 350, 359, 369; ventosa, 564; verrucosa, 359; vitellinella, 156.
Lecanorei, 1.
Lecidea acrocyanea, 361; acunhuna, 156; ænea, (ftnote) 350, 360; anteposita, 400; auriculata, 361, 362, var. diducens, 362; brachyspora, 362, 369; canescens, 156, 565; candidescens, 156; crystallifera, 400; cyanea, 361; (Psora) decipiens, 360, 400; despecta, 362; Dicksonii, (ftnote) 350, 361; disciformis, 401, 563; disjungenda, 156; effusa, 153; elata, 361, 362, 369; elæochroma, 361, β muscorum, 361, var. γ, pilularis, 361; endoleuca, 400; ephizousa, 156; epipasta, 153; epiplacodia, 153; crassipes, 361; Flindersii, 400; geographica, 563; griseoatra, 360; hansatica, 361; immarginata, 400; lapicida, var. seriata, 361; leucophæa, β griseoatra, (ftnote) 350, 360; lurida, 577; lutea, 379; melina, 564; parasema, 563, var. elæchroma, 563; parmeliarum, 401; parviflora, 399; paupercula, (ftnote) 350, 360; (Psora) rubiformis, 360; (Biatora) rupestris, 360; septosior, 400; scrobiculata, 362; sp. ?, Floeberg Beach, 363; subjiciens, 156; superjecta, 156; teichiodes, 153; terebratula, 156; thyrsodes, 154; (Biatora) tornoënsis, 360; ultima, 363; versicolor, 400; vesicularis, 577; vorticosa, 361.
Lecideei, 399.
Leciographa convexa, 368.
Lecothecium asprellum, 367.
Leguminosæ, N. China, 381.
Leidesia, 230, 264, 265.
Leimanthium glaucum, 482; hybridum, 175; lætum, 478; monoicum, 473; pallidum, 478; sibiricum, 483; virginicum, 475.
Leontice altaica, 377; microrhyncha, 377, var. venosa, 378.
Lepidanthus, 254.
Lepidium latifolium, 378; ruderale, 378.
Lepidoturus, 232, 257, 264.
Lepraria alba, 564.
Leptobotrys, 239.
Leptocarpus disjunctus, charac. of, 344; Schultzii, 344.
Leptogium fluviatile, 566; lacerum, f. fimbriatum, 567, f. pulvinatum, 567; palmatum, 567; marginellum, 567; plicatile, 566; sacerum, 567; sinuatum, 567; schraderi, 367; tetrasporum, 367.
Leptonema, 212, 254.

Leptopus, 254.
Leptorhachis, 239.
Leucandra, 239.
Leucocrinum, 410, charac. of, 453; montanum, 453, var. major, 453.
Leucocroton, 231, 262.
Lhodra, 283.
Licania, albumen in seed of, 372; aperta, (ftnote) 373; costata, 372; fruit of, 371, 372; glabra, 372; heteromorpha, 373; how differing from Moquilea, 371; incana, (ftnote) 335; Kunthiana, (ftnote) 335; prismatocarpa, 371, 372; pubiflora, (ftnote) 373; sp. from Corcovado, 335; Turiuva, (ftnote) 373.
Lichen alpicolus, 397; ambiguus, 401; amplissimus, 394; antarcticus, 396; ascendens, 398; atro-cinereus, 400; barbatus, 555; candelarius, 565; caperatum, 394; chrysophthalmus, 396; cornutus, 558; cornucopoides, 557; corrugatus, 565; cribrosus, 393; cristatus, 566; crocatus, 394, 396; decipiens, 400; deformis, 393; dendrosmæ, 398; deustus, 397; dichotomus, 396; fascicularis, 391; fagineus, 564; filiformis, 558; filix, 396; floridus, 393; fragilis, 392; granularis, 397; guttatus, 399; hypnorum, 398; immarginatus, 400; imperforatus, 393; lateritius, 399; latissimus 396; linearis, 396; multiflorus, 393 nudus, 399; obductus, 391, 392; occultatus, 399; parviflorus, 399; pictus, 397; proboscideus, 397; proboscidens, 575, 576; pinnatus, 394; pubescens, 391; rangiferinus, 393; ramulosus, 392; sanguinarius, 563; scrobiculatus, 396; siliquosus, 562; soccatus, 399; sordidus, 401; spongiosus, 399; tessulatus, 401; tiliaceus, 394; tremelloides, 567; ustulatus, 394; ventricosus, 559; vermicularis, 393; vestigiatus, 393; vulpinus, 556.
Lichenacei, 392.
Lichens, Australian in Brit. Mus., J. M. Crombie, on, 390; of 'Challenger,' Dr. J. Stirton's remarks on Mr. Crombie's paper on, 152; of Dillenius's 'Historia Muscorum' as illustrated by his herbarium, by the Rev. J. M. Crombie, 553; of English Polar Exped., Prof. Fries on, 346.
Lichensteinia lævigata, 449; undulata, 449.
Ligustrum vulgare, absorp. leaf, 321, 323.
Liliaceæ (of N. China), 387; on the aberrant tribes of, 405; veræ, subord., 405, 413.
Lindsaya repens, 403.
Linostachys, 230, 257.
Liriope, 413, charac. of, 499; graminifolia, 499, var. densifolia, 500, var. minor, 500; spicata, 499.
Liriopeæ, 405, 407, 412.
Lithoxylon, 208.
Littonia, 410, charac. of, 458; modesta, 458.
Lloydia triflora, 388.
Lobarina scrobiculata, 395.
Lockwood, E., notes on the Mahwa Tree, 87.
Lodhra, charac. of, 298; acuta, 301; apicalis, 302; attenuata, 299; bractealis, 301; caudata, 300; cordifolia, 301; coronata, 302; crassifolia, 302; cratægoides, 298; cucullata, 301; cuneata, 301; elegans, 301; ferruginea, 299; floribunda, 299; foliosa, 300; Gardneriana, 300; grandiflora, 299; Hamiltoniana, 299; hirsuta, 301; hispidula, 301; javanica, 302; jucunda, 301; læta, 301; leiostachya, 300; leucantha, 300; Lohri, 298; lucida, 299; macrophyllea, 299; marginalis, 301; microcarpa, 302; microphylla, 300; monantha, 300; nervosa, 299; obovata, 301; obtusa, 300; oxyphylla, 300; pedicellata, 300; polycarpa, 301; polystachya, 300; pulchra, 300; pyrifolia, 299; racemosa, 298; ramosissima, 299; ribes, 302; rubiginosa, 299; rufescens, 301; Samuntia, 298; spicata, 298; sulcata, 300; xanthophylla, 302; Verhuelli, 302.
Longetia, 214.
Lonicera Maackii, 383; Ruprechtiana, 383.
Lophostigma, 36.
Loranthaceæ, N. China, 385.
Loureia, 255.
Lychnis dioica, exper. absorp., 317.
Lycoperdon atropurpureum, 15, var. arcticum, 16; cretaceum, 15.
Lynch, R. Irwin, on Branch Tubers and Tendrils of Vitis gongylodes, 306; on Mechanism for Fertilization of Meyenia erecta, 145; on the Seed-structure and Germination of Pachira aquatica, 147.
Lyngbya martensiana, 281.
Lysimachia barystachys, 384; clethroides, 384; nummularia, absorp. leaf of, 325.

Mabea, 240, 259.
Macaranga, 234, 264, 266.
Macrosporium compactum, 142.
Mæsobotrya, 216, 261.
Mahwa Tree, notes on the, 87; corolla recommended for importation, 90; forest animals feast on, 88; spirit made from, 89; used by poor, 89; yield of corollas, 88.
Mallotus, 233, 264, 266; Porterianus, 233.
Maltea, 343.
Malva, absorp. dew, 323.
Managa, belongs to the Aurantiaceæ, 342; guianensis, 341.
Manihot, 228, 255, 262, 266.
Manniophyton, 224, 263.
Mappa (*Juss.*), 234; capensis, 234.
Maprounea, 241, 260.
Mareya, 230, 257.
Marquartia (synon. Pandanus), 35; globosa, 39, 64; leucacantha, 39, 55.
Marrubium incisum, 385.
Marupa, 148, charac. of, 150; Francoana, 150; paraensis, 151.
Masters, Dr. M. T., on Morphology and Physiology of Conifer-leaves, 547; on Restiaceous plant in Cochin China, 343.
Mazus stachydifolius, 385.
Meehan, Thos., on laws governing production of Seed in Wistaria sinensis, 90.
Meineckia, 212.
Melanotheca aciculifera, 155; rhaphidiza, 155.
Melanthesiopsis, 212.
Melanthium, 411, charac. of, 474; æthiopicum, 446; angustifolium, 445; Bergii, 447; biglandulosum, 475; blandum, 447; bracteolare, 471; Brownii, 452; cæruleum, 447; capense, 443; caricinum, 451; ciliatum, 447; densum, 478; eucomoides, 444; glaucum, 482; gracile, 447; gramineum, 445; guineense, 451; Hultgreenii, 482; hybridum, 473, 475; indicum, 450; inustum, 436; japonicum, 469; junceum, 447; lætum, 478; latifolium, 475; luridum, 447; luteum, 469; marginatum, 436, 447; monoicum, 473, 475; monopetalum, 435; muscætoxicum, 478; myoctonum, 478; nigrum, 472; phalangioides, 478; polygonium, 475; pumilum, 436, var. latifolia, 436; punctatum, 445; purpurea, 435; racemosum, 450, 475; remotum, 435; revolutum, 436; rubicundum, 447; secundum 447; Schlectendalianum, 447; sibiricum, 483; sp., 437; spicatum, 435; tenue, 436; triquetrum, 447; tubiflorum, 436; uniflorum, 446; virens, 471; virginicum, 475; viride, 449; Wurmbeum, 435.
Melaspilea circumserpens, 401.
Melia, 343.
Meliaceæ, 284.
Melica scabrosa, 388.
Melilotus parviflora, 381.
Melosira nummuloides, 10, 11.
Menispermaceæ, N. China, 377.
Menispermum davuricum, 377.
Mercurialis, 229, 230, 264, 265; absorption dew by, 323.
Merendera, 409, charac. of, 437; abyssinica, 438, 440; Aitchisoni, 440; attica, 438; bulbocodioides, 441; bulbocodium, 438, 440, var. bulbocodioides, 441; caucasica, 438; filifolia, 438, 439; hastulata, 438, 439; linifolia, 439; longispatha, 440; montana, 440; persica, 438, 440; robusta, 438, 440; Schimperiana, 440; sobolifera, 438, 439.
Merendereæ, charac. of, 409.
Meridion circulare, 11.
Merulius aurantiacus, 15.
Methonica Doniana, 457; grandiflora, 458; Leopoldii, 458; Petersiana, 458; Plantii, 458; platyphylla, 458; superba, 457; virescens, 458.
Mettenia, 236.
Meyenia erecta, mechanism fertiliz. of, 145.
Micrandra, 220, 222, 262.
Micrococca, 230, 264, 265.
Microdesmis, 218, 263.
Microglena cella, 366; sordidula, 366.
Microstachys, 243.
Microthelia atramentea, 368; melanostigma, 368; Metzleri, 368.
Miers, John, notes on Moquilea, 371; on Marupa, a genus of the Simarubaceæ, 148; on Schoepfieæ and Cervantesieæ, distinct tribes of Styraceæ, 68; on some genera of the Olacaceæ, 126; on South-American plants of uncertain position, 333; on the Symplocaceæ, 283.
Miersia, 407, 413, charac. of, 506; chilensis, 506, 507; cornuta, 507; major, 507; minor, 507; myoides, 507.
Milligania, charac. of, 406, 410, 454; densiflora, 455; Johnstoni, 455; longifolia, 455; stylosa, 455.
Milnea edulis, 343.
Mimulus moschatus, absorp. leaf, 324.

Minguartia, charac. of, 338, 341; belongs to the Crescentiaceæ, 339; guianensis, 339.
Mischodon, 214, 263.
Mocinna, 221, 255.
Molina, *C. Gay*, 204.
Molineria, 95, 98, charac. of, 119; crassifolia, 121; Finlaysoniana, 121; gracilis, 120, var. Jamesoni, 121; recurvata, 120; rhizophylla, 121.
Monocaryum fasciculare, 433.
Moore, S. Le M., and J. G. Baker on Flora of N. China, 375,
Moquilea, 333; notes on, with descrip. of new species by J. Miers, 371; organensis, 374; Turiuva, 373; tomentosa, (ftnote) 334.
Moricandia arvensis, 328; suffruticosa, 328.
Morphological notes on Thunbergia, 1.
Morphology and Physiology of Conifer-leaves, 547.
Morris, D., on Structure and Habit of Hemeleia vastatrix, the Coffee-leaf disease, 512.
Morung Elachi, or Cardamom, 4.
Murraya exotica, 342.
Musk-ox in Grinnell Land, does not feed on Lichens, Capt. Feilden on, 349.
Myoschilos belongs to Olacaceæ, 126; charac. of, 127; oblonga, 128.
Myriophyllum sp., 281.
Myrtus chinensis, 297.
Mystacidium, 313.

Napaca, 215.
Narthecium boreale, 486; calyculatum, 487; falcatum, 489; glutinosum, 490; iridifolium, 487; pubens, 491; pusillum, 486.
Nasturtium palustre, 378.
Navicula acrosphæria, var. sandvicensis, 282; ambigua, 11; arctica, 11; borealis, 11; cryptocephala, 11; didyma, 11; directa, 11; elliptica, 282; firma, 11; fortis, 11; gastrum, 282; gibberula, 282; globiceps, 11; gracillima, 282; liber, 11; mesolepta, 11; minutula, 11; rhomboides, 282; rhynococephala, 11; Smithii, 11; subsalina, 11.
Nectria cinnabarina, 563.
Neoboutonia, 232, 264.
Neorœpera, 254, 265.
Nepal Winged Cardamom, 3.
Nepeta, absorp. dew, 323; glechoma, 385, and absorp. leaves of, 318, 319.
Nephrodium chinense, 390; erythrosorum, 390; Filix-Mas, absorp. frond of, 319, var. elongatum, 390; sagenoides, 404.
Nephromium cellulosum, 396; lævigatum, 574, var. parile, 574.
Neuropogon melaxanthus, 394; trachycarpus, 156; Taylori, (ftnote) 346.
Nitzschia angularis, 11; closterium, 11; sigma, 11.
Nomenclature of Plants, Mr. G. Bentham on, 189–198; authors appropriate long-established names, 189; binomial appellations and third word, 190; long-established custom in maintenance of names, 191; names derived from Greek, 106; names overlooked, 194; no right of priority to ante-Linnean names, 193; object of Linnean nomenclature, 190; restoration of neglected names, 192; specific nomenclature, combining old sp. with new gen., 197; trouble arising from corrections in spelling, 195.
Normandia lætevirens, 575.
Northern China, flora of, 375.
North-Indian Cardamoms, 5.
North India, ferns of, 402.
Nostoc aureum, 9; commune, 8.
Nostochineæ, 8.
Note on Gardenia turgida, by C. B. Clarke, 310.
—— Fruiting of Wistaria sinensis in Europe, by W.T. Thiselton Dyer, 329.
—— genus Oudneya, by Dr. H. Trimen, 328.
—— occurrence of a Restiaceous plant in Cochin China, by Dr. M. T. Masters, 343.
—— probable migration of Pinguicula grandiflora through agency of birds, by Prof. Allman, 157.
—— relation between Morphology and Physiol. in leaves of certain Conifers, by Dr. M. T. Masters, 547.
—— South-African Orchids, by W. Mansell Weale, 313.
—— structure and habit of Hemileia vastatrix, by D. Morris, 512.
Notes on Algæ from Lake Nyassa, E. Africa, by G. Dickie, 281.
—— Cleistogamic Flowers, chiefly of Viola, Oxalis, and Impatiens, by A. W. Bennett, 269.
—— Euphorbiaceæ, by G. Bentham, 185.
—— Mahwa Tree (Bassia latifolia), by E. Lockwood, 87.
—— Moquilea, with descrip. of new species, by J. Miers, 371.
Notes on Thunbergia, by M. Hartog, 1.

Nucellus, use of term, (ftnote) 521.
Nutrition of Drosera rotundifolia, 17; additional memorandum, 32.
Nyassa Lake, Algæ from, 281.

Obesia, 163.
Observations on Hemileia vastatrix, the Coffee-leaf Disease, by Rev. R. Abbay, 173.
—— on the genus Pandanus (Screw-Pines), by Dr. I. B. Balfour, 33.
Odina Francoana, 149.
Oiti, a kind of S. Amer. fruit, 334.
Olacaceæ, on some genera of, 126.
Oldfieldia, 214, 263.
Oleineæ, N. China, 384.
Omphalea, 241, 259.
Omphalodes sericea, var. 384.
On Absorption of Rain and Dew by Green Parts of Plants, by the Rev. G. Henslow, 313.
On Algæ found during the Arctic Expedition, by Dr. G. Dickie, 6.
On Branch Tubers and Tendrils of Vitis gongylodes, by R. Irwin Lynch, 306.
On discovery var. Cedar of Lebanon on Mountains of Cyprus, with letter from Sir Samuel Baker, by Sir J. D. Hooker, 517.
On Helvella californica, by W. Philips, 402.
On Laws governing production of seed in Wistaria sinensis, by Thos. Meehan, 90.
On Lichens collected during English Polar Exped., 1875–76, by Prof. T. M. Fries, 346.
On Marupa, a genus of the Simarubaceæ, by John Miers, 148.
On Mechanism for the Fertilization of Meyenia erecta, by R. Irwin Lynch, 145.
On Schoepfieæ and Cervantesieæ, distinct tribes of the Styraceæ, by J. Miers, 68.
On some Genera of the Olacaceæ, by J. Miers, 126.
On some South-American genera of uncertain position &c., by J. Miers, 333.
On the Source of the Winged Cardamom of Nepaul, 3.
On the Symplocaceæ, by J. Miers, 283.
On two kinds of Dimorphism in the Rubiaceæ, by C. B. Clarke, 159.
Onoclea germanica, 389; sensibilis, 389.
Ononis columnæ, 278.
Onygena equina, 557.
Opegrapha dendritica, 401; dialeuca, 154; plebeja, 401; undulata, 154; varia f. signata, 563.
Ophiopogon gracilis, 500; indicus, 501; intermedius, 501; Jaburan, 502; japonicus, 500, 501, var. intermedius, 501, var. Wallichianus, 501; longifolius, 500; Malcolmsonii, 501; minor, 501; mollis, 501; Muscari, 500; prolifer, 502; spicatus, 499, 501; umbraticola, 501.
Ophiostachys virginica, 469.
Ophthalmoblapton, 241, 259.
Orchids, Note on South-African, 313.
Orfilea, 231, 257.
Origin of so-called Scorpioid Cyme, Rev. G. Henslow on, 511.
Ornithoglossum, 409, charac. of, 448; glaucum, 449, var. grandiflorum, 449, var. madagascariensis, 449, var. undulatum, 449, var. Zeyheri, 449; Lichensteinii, 449; undulatum, 449; viride, 449.
Orobus lathyroides, 381.
Orphinospora grœnlandica, 364.
Orthosira marina, 11.
Oscillaria sp.?, 281; tenuis, var. sordida, 8.
Oscillariaceæ, 8.
Osmunda cinnamomea, 390.
Ostodes, 225, 263; Helferi, 225; minor, 225.
Oudneya africana, history of, 328.
Oudneya and Henophyton identical, 329.
Ovibos moschatus, food of, 349.
Oxalideæ, N. China, 380.
Oxalis acetosella, 269, 275, 280, 380; Cleistogamic flowers of, 275; corniculata, 380; obtriangulata, 380.

Pachira aquatica, cotyledons of, 148; seed-structure and germination of, 147.
Pachysandra, 205.
Pachystemon, 234.
Pachystroma, 228, 262.
Pæonia albiflora, 376; oreogeton, 376; obovatæ, 377; Wittmanniana, 377.
Palisade cells in Conifers, 549; in Dianthus and Narcissus, (ftnote) 552.
Palissya, 231, 257.
Palura, 283, charac. of, 297; odorata, 298; pendula, 297; sinica, 297.
Pandanus acuminatus, 40; affinis, 40; albus, 40; altissimus, 40; amaryllifolius (*Roxb.*), 40, 50, *Hort.* 50; amarylloides, 41; Amherstiæ, 41; andamanensis, 41; andamanensium, 41; angustifolius, 41; aragoensis, 41;

aquaticus, 41; atrocarpus, 41; australis, 41; Bagea, 42, (*Miq.*) 45; Balansæ, 42; Barklyi, 42; Bidur, 40, 42, (*Jungh.*) 45; Blancoi, 42, 55; Boivini, 67; Boryi (*Gaud.*), 42, 55; Boucheanus, 42; bromeliæfolius, 42; butyrophorus, 42; calathiophorus, 42; Candelabrum, 42, (*Pal. Beauv.*) 49, (*Hook.*) 64; caricosus, 43, (*Miq.*) 48, (*Hort.*) 48; cauliflorus (*Carm.*), 44; ceramensis (*Hort.*), 44; ceramicus (*Rumph.*), 41, 44; ceylandicus, 67; Chamissonis, 44, 55; conglomeratus, *Balf. fil.* 35, 44; conoideus (*Lam.*), 41, 44, (*Pet.*) 44, (*De Vriese*) 44, 53, 59; crassipes (*Wall.*), 44, 48; cylindricus (*Hort.*), 44; decorus, 44; decumbens, 44; deflexus (*Hort.*), 44, 45; demissus (*Soland.*), 45; distichus (*Hort.*), 45, 64; doornianus, 45; Douglasii (*Gaud.*), 45, 55; drupaceus, 45; dubius (*Spreng.*), 42, 45, 46, 47; edulis (*De Vriese*), 45, 46, (*Pet.*) 46; elegans (*Pet.*), 46; elegantissimus (*Hort.*), 46, 64, var. latifolius (*Hort.*), 46; ensifolius (*Pet.*), 46; erigens (*Pet.*), 46, 53; exaltatus (*Blanco*), 46; Eydouxia, 46; fascicularis, 55, (*Lam.*) 46, β (*Lam.*) 45, 47; flabelliformis, 47, (*E. Carr*) 64; flagelliformis, 47; fœtidus, 47; Forsteri, 47; fragrans, 47; freycinetioides, 47; furcatus, 35, (*Roxb.*) 36, 47, (*Thw.*) 67; glaucescens (*Hort.*), 48; glaucus (*Hort.*), 48, 61; globuliferus (*Pet.*), 48, 61; gracilis (*Blanco*), 48; gramineus (*Hort.*), 48; graminifolius, 48; helicopus, 48; heterocarpus, 48; Heudelotianus, 49; Hoffa (*Chapelier*), 49; Hornei, 49; horridus (*Rnwdt.*), 48; Houlletii, 49; humilis (*Rumph.*) 49, (*Jacq.*) 49, (*Lour.*) 49; Iceryi (*Horne*), 49; inermis, (*Blanco*) 49, (*Rnwdt.*) 50, (*Roxb.*) 49; inclinans (*Soland.*), 49; integrifolius, 49; javanicus (*Hort.*), 42, 49, var. glaucescens (*Hort.*), 42, 49, var. variegatus (*Hort.*), 42, 49; Kaida, 49; Korthalsii, 67; Kurzianus, 67; labyrinthicus, 49; lævis, 50; lagenæformis, 50; Lais (*Krz.*), 48, 50; latifolius, 40, (*Rumph.*) 42, (*Hort.*) 42, (*Rumph.*) 50, (*Hort.*) 50, (*Voigt*) 51; latissimus, 40, (*Blum.*) 45, 51; leonensis, 51; Leram, 51, β. macrocarpa, 51; leucanthus (*Hasskl.*), 51, 55; leucacanthus, (*Hort.*) 51, (*Hort. & Hasskl.*) 55; Linnæi, 51, (*Gaud.*) 55; Linnei (*Hort.*), 51; littoralis (51), (*Jungh.*) 56; lividus, 51; longifolius (*Hort.*), 45, 50, 52; Loureiri, 52; lucidus, 52; macrocarpus, 52; madagascariensis, 52; magnus (*Rumph.*), 46, 52; malatensis, 52; marginatus, 52; maritimus, 52, (*Pet.*) 64; mauritianus, 52, (*Krz.*) 64; Menziesii, 52; microcarpus, 52; microstigma, 53; Millore (*Roxb.*), 51, 53; militaris, 53; Minda, 53; minor, 53; monodon, 53; montanus, 41, 53, (*Bory*) 46; monticola, 54; moschatus, 40, 50, 54; Motleyanus, 68; multispicatus, 54; muricatus, 54; nitidus, 54, (*Krz.*) 62; nudus, 54; obeliscus, 64; oblongus, 54; odoratissimus, 35, (*Blum.*) 40, (*L. fil.*) 42, 45, 46, (*Noronh.*) 50, (*Hort. & L. fil.*) 54, (*Lour.*) 57; odoratus (*Rumph.*), 40, (*Salisb.*) 57; ornatus, 57; ovatus (*Krz.*), 57; palustris, 57; Pancheri, 57; parasiticus, 57; pedunculatus (*R. Br.*) 47, 58; Pervilleanus (*Krz.*), 42, 58; polycephalus, 58; polyryzos, 58; Porteanus, 59; princeps, 59; proliferus, 59; prostratus, (*Balf. fil.*) 44, 59; purpurascens, 59; pygmæus, 59; pyramidalis, 60; pyramidatus (*Carm.*), 53; racemosus, 60; radicans, 60; reflexus, 60; repens (*Rumph.*), 60; reticulatus, 60; Rheedii (*Gaud.*), 56, 60; Rhumphii (*Gaud.*), 56, 60; Sabotan, 60; Samak, 60; sativus (*Pet.*), 61, 64; Sechellarum, 61; sessilis, 61; sphærocephalus (*Gaud.*), 57, 61; sphæroideus, 61; spinifractus (*Krz.*), 48; spinifructus (*Dennst.*), 48, 61; spiralis, (*R. Br.*) 56, (*Miq.*) 62; spurius, (*Rumph.*) 66, (*Miq.*, *Rumph.*, *Hort.*) 62; stenophyllus, 62; striatus (*Carm.*), 60, 62; strigilis (*Carm.*), 45, 62; Sussea, 62; sylvestris, 41, (*Krz.*) 42, (*Bory*) 46, 62, (*Krz.*, *Rumph.*) 63; tectorius (*Soland.*), 56, 63; tenuifolius, 63; terrestris, 41, (*Rumph.*) 63; tetrodon, 63; turbinatus, 63; unguifer, 68; unipapillatus, 63; urophyllus (*Hance*), 48, 63; utilis, (*Bory*) 46, 47, 61, 62, 63, β. lucidus (*Krz.*), 65; Vacqua (*Carm.*), 65; Vandermeeschi, 65; variegatus (*Miq.*), 61; Veitchii (*Hort.*), 64, 65; verus (*Rumph.*), 56; viscidus, 65; vittariifolius, 65; Yvanii, 68.

Pandanus, general remarks on, 33–37, geograph. distrib. of, 36; history and

literature of, 34; observations on genus by Dr. I.B. Balfour, 33; preservation of fruits of, 37; remarks on names of species, 36; synopsis of the genus, 38.
Pandanaceæ, 33.
Panicum mandschuricum, 388.
Pannaria lepidiota, 577; nigro-cincta, 397; rubiginascens, 397; rubiginosa, 397, 571; semiviridis, 397.
Pao amarello, a kind of S. Amer. timber, (ftnote) 334.
Pao pombo, a S. Amer. wood, 149.
Papaveraceæ, N. China, 378.
Paracroton, 225, 263.
Paradenocline, 230.
Paraphyllanthus, 210, 211, 253.
Pardanthus chinensis, leaves of, (ftnote) 552.
Parinarium of Aubl. and De Cand. compared, 335.
—— brachystachyum, (ftnote) 335; campestre (fruit of), 336; coriaceum, (ftnote) 335; excelsum, 337; glaberrimum, 336; Griffithianum, 336; Maranthes, 336; montanum (fruit of), 336; scabrum, 336; senegalense, 387; sumatranum, 336.
Paris obovata, 388.
Parmelia acetabulum, 572; adepta, 155; angustata, 395; australiensis, 395; Borreri, (ftnote) 346; caperata, 394, 573, var. rufescens, 573; caperatula, 394; centrifuga, 353, 568, 572; circinata, 565; conspersa, 353, 572, 394, f. isidiata, 572, var. f. stenophylla, 394; constrictans, 395; corniculans, 568, 578; encausta, β. intestiniformis, 353; euplecta, 155; exasperata, 572; hottentotta, 568; hypotropa, 567, f. parmata, 577; lanata, (ftnote) 347, 350, 353, 395, 555, var. reticulata, 562; limbata, 394; lugubris, 395; mundata, 395, var. pulverata, 395; olivacea, 572, var. β. prolixa, 353; ophylla, 394, var. multipartita, 394; perforata, 567; perlata, 567, var. olivetorum, 567, f. sorediata, 567; pertusa, 395; physodes, var. labrosa, 568; placorhodioides, 395; pulverata, 395; sagenalis, 565; saxatilis, 572, var. furfuracea, 573, var. omphalodes, 353, 572, var. sulcata, 573; semiviridis, 398; separata, 353; solenaria, 569; sordida, 564; subaurifera, 572; subcaperatula, 394; tenuirimis, 394; tiliacea, 394; tristis, 562; uniformis, 353.
Parmeliei, 394.
Parmentiera, 341; aculeata, 338; cereifera, 338; edulis, 338.
Patellaria cyanea, 142.
Pauridia, 94, 98, charac. of, 125; hypoxidoides, 126.
Pausandra, 224, 262.
Payer, Julius, observ. on Arctic Lichens, 347.
Payeria, 218.
Pedilanthus, 202, 250.
Peliosanthes, 407, 413, charac. of, 503; campanulata, 504; courtallensis, 503, 504; Griffithii, 503, 506; humilis, 503, 505; javanica, 503, 505; longifolia, 503; macrophylla, 503, 505; neilgherriensis, 503; Teta, 503, 504, 505; violacea, 503, 504, var. Clarkei, 504, var. minor, 504, var. princeps, 504.
Peltidea apthosa, 574; venosa, 574.
Peltigera canina, 367, 574, f. membranacea, 396; horizontalis, 574, var. muscorum, 574; polydactyla, 574, f. pellucida, 574; rufescens, 574; scabrosa, 367; scutata, 574; spuria, 574.
Peltigerei, 396.
Pentabrachion, 218.
Peponopsis adhærens, 309.
Pera, 245, 260.
Pertusaria amara, 564; communis, 564; coriacea, 359; fallax, 564; globulifera, f. discoidea, 564.
Petalostigma, 213, 265.
Petrocarya (*Jack*), charac. of, 336.
Petrosavia, 406, 412, charac. of, 492; stellaris, 492.
Peziza ciborium, 13, 16; Curreiana, 13; stercorea, 16.
Pharetrella alba, 497.
Philadelphus, absorp. dew, 323; coronarius, var. tenuifolius, 382.
Phillips, W., on Helvella californica, 402.
Phlyctæna smilacis, 141.
Phlyctis agelæa, 564.
Phoma hysteriiforme, 141.
Phyganthus vernus, 496.
Phyllantheæ, charac. of, 200, 206; geograph. distrib. of, 253.
Phyllanthidia, 254.
Phyllanthus, 209, sections of, 210, 253; bacobotryoides, 211; distichus, 261; fluitans, 212; Niruri, 211, 254, 260; urinaria, 211.
Phyllobotryum, 236, 264.
Phyllosticta micropuncta, 142.
Phyllotaxis, new principle of, 511.
Physcia aipolia f. acrita, 571; aquila, 570; cæsia, 354, 571; chrysophthalmia, 396, 556; ciliaris, 568, f. actinata, 568, f. agriopa, 568, f. melanosticta.

568; flavicans, 556; intricata, 569; leptalea, 568; leucomela, 569; obscura, var. chloantha, 568, var. virella, 571; parietina, 572; picta, 396; pulverulenta, 571, f. ægyptiaca, 571, β. muscigena, 345, 350, f. panniformis, 571; stellaris, 571. β. tribacia, 354, var. γ. marina, 354; subexilis, 396; tenella, 568; ulothrix, 571; villosa, 569.
Physciei, 396.
Piaranthus, 162, 163.
Picea ajanensis, young shoot of, 547, 549; Alcockiana, (ftnote) 551; Maximowiczii, resin-canals of, 549; sitchensis, leaves of, 550, (ftnote) 551; tricolor, leaves of, 550.
Pierardia (*Roxb.*), 216.
Pimeleodendron, 240, 260.
Pinguicula grandiflora, 157; lusitanica, 158.
Pinus Massoniana, 389.
Piranhea, 215, 261.
Placodium, 153; murorum, 565.
Plagiorhegma (*Maxim.*), 377.
Plants, absorption rain and dew by green parts of, 313, 324; advantages of syringing, 325.
Platygyne, 238, 259.
Platysma cucullatum, 569; diffusum, 573; Fahlunense, 572; glaucum, 573, f. ampullaceum, 572, var. fallax, f. coralloidea, 570; nivale, 569; Richardsonii, 577.
Platystigma, 216.
Pleea, 406, 412, charac. of, 421; Sieberi, 452; tenuifolia, 491.
Pleiostemon, 212.
Pleopeltis erythrocarpa, 403.
Pleraginea odorata, 333; rufa, 333; umbrosissima, 334.
Pleurosigma angulare, 11; longum, 10, 11.
Plukenetieæ, 236, 237, 258; penninervia, 238; verrucosa, 238; volubilis, 237.
Poa pratensis, 388; sphondyloides, 388.
Podadenia, 232, 264.
Podanthes, 163.
Podocalyx, 217.
Podosira hormoides, 11.
Podosphenia gracilis, 11.
Pogonophora, 218, 261.
Poinsettia, 202, 249.
Polar Exped., Lichens of, by Prof. Fries, 346.
Polemonium, absorp. leaf, 319.
Polyblastia bryophila, 366; intercedens, 366.
Polycoccum sporastatiæ, (ftnote) 350, 370.
Polygala jagonica, 379; sibirica, var. tenuifolia, 379.
Polygalaceæ, N. China, 379.
Polygonaceæ, N. China, 385.
Polygonatum japonicum, 387; verticillatum, 387; vulgare, 387.
Polygonum fagopyrum, 385; sibiricum, 385.
Polypodium daræforme, 403; lineare, 390; linearifolium, 290.
Polystachya, 313.
Poppigia chilensis, 496.
Populus balsamifera, var. laurifolia, 387; tremula, 387.
Poranthera microphylla, 251.
Potamogeton crispus, 345; natans, 345; perfoliatus, 345; sp.?, 281.
Potentilla chinensis, 381; flagellaris, 381; multifida, 381; supina, 381.
Præalstonia, charac. of, 29; arechea, 291; cernua, 292; coccinea, 291; coriacea, 292; Matthewsii, 292; mucronata, 292; nuda, 292; octopetala, 291; parvifolia, 292; reflexa, 292; rufescens, 292; serratula, 292; theæformis, 291; tomentosa, 292.
Prasiola Sauteri, 7.
Preservation of cut flowers, 326.
Primula cortusoides, 384.
Primulaceæ, N. China, 384.
Protohopea, charac. of, 289; cernua, 290; tinctoria, 290.
Prunella vulgaris, 385.
Prunus japonica, 381; Laurocerasus, 321, 322; lusitanica, 322; Padus, var. pubescens, 381; Pseudocerasus, 381; sp.? near P. japonica, (ftnote) 375; Ssiori, 381; tomentosa, 381.
Pseudocroton, 227, 262.
Pseudophyllanthus, 254.
Pseudotsuga, (ftnote) 549.
Psoroma asperellum, 398; hypnorum, 399; soccatum, 398; sphinctrinum, 398, var. leprolema, 398.
Pteris aquilina, 389.
Pterococcus, 288, 258.
Pulmonaria, absorp. dew, 323.
Pulvini in Spruces, nature of, 547.
Purisantha, subgen., 165.
Putranjiva, 213, 263.
Pycnanthera, 225.
Pycnocoma, 237, 264.
Pycnothelia papillaria, 561.
Pyrenocarpei, 401.
Pyrus baccata, 382; chinensis, 382.

Quercus, absorp. dew, 323; MacCormickii, 387.

Quinchamalium belongs to Olacaceæ, 126, charac. of, 134; chilense, 135; elegans, 137; fruticulosum, 138; gracile, 137; linifolium, 135; majus, 136; procumbens, 136.
Quivisia, 218.

Racaria belongs to Meliaceæ, 342, 343; sylvestris, structure of, 342.
Racodium rupestre, 562.
Radiola millegrana, 158.
Ramalina arabum, 555, 578; aulota, 155; bermudiana, 154; calicaris, 570, var. subampliata, 570; complanata, 154; cuspidata f. cornuta, 562; evernioides, 569; farinacea, 570, f. phalerata, 570; fastigiata, 569, 570, f. minuta, 570; fraxinea, 570; minuscula, 155; pollinaria, 569; scopulorum, 570; tenuior, 153.
Ramalinei, 393.
Ramalodium succulentum, 392.
Ramelia, 237.
Ramulina geniculata, 393.
Randia, 310; uliginosa, 160.
Randioides, 161.
Ranunculaceæ of China, 375.
Ranunculus acris, N. China, 376; auricomus, 376; chinensis (*Bge.*), 376; pennsylvanicus, 376; repens, 376; scleratus, 376.
Raphoneis Quarnerensis, 11.
Ratiga, 238.
Reidia, 21, 254.
Reindeer moss, 349.
Relations between Morphol. and Physiol. in leaves of Conifers, Dr. M. T. Masters on, 547.
Remarks on Carpesium cernuum? as indigenous to Australia, F. M. Bailey on, 345.
—— on Mr. Crombie's paper on the 'Challenger' Lichens in Journ. Linn. Soc. vol. xvi., by Dr. Stirton, 152.
Restiaceous plant in Cochin China, Dr. Masters on, 343.
Rhabdonema arcuatum, 11.
Rhamnaceæ, N. China, 380.
Rhamnus crenatus, 380.
Rhizocarpon botularium?, 366; chionophilum, (ftnote) 350, 365; endamyleum, 365; geographicum, 347, 365; germinatum, (ftnote) 350, 365; grande, 365; inops, 365; (Catocarpon) Rittokense, 365.
Rhododendron micranthium, 384; sp. (near R. dilatum) N. China, (ftnote) 375.
Rhoicosphenia curvata, 11.
Rhopalostyles, 239.
Ribes petræum, 382.
Ricasolia lætevirens, 573.
Richeria, 217, 261.
Ricinella, 230; myrciæfolia, 231.
Ricinodendron, 224, 263.
Ricinus, 234; communis, 261.
Rinodina aterrima, 368; exigua β. confragosa, (ftnote) 350, 357; mniaræa β. calcigena, 357; nimbosa, 357; Panschiana, 357; turfacea, (ftnote) 350, 356, 357, var. orbata and var. roscida, 357.
Rivularia plicata, 565.
Rivulariaceæ, 8.
Roccella fuciformis (minor), 570; montagnei, 393; patellata, 153; phycopsis, 570; tinctoria, 562.
Roccellei, 393.
Rondeletia, 160.
Rosa davurica, 382; multiflora, 382.
Rosaceæ, N. China, 381.
Rottlera (*Roxb.*), 233.
Roussinia, 35; indica (*Gaud.*), 51, 57, 66.
Rubiaceæ of N. China, 383; on two kinds of dimorphism in, 159.
Rubus, 323; craterifolius, 381.
Rumex, 323; acetosa, 385; crispus, exper. absorp., 317.
Russula integra, 13, 15.
Rutaceæ, N. China, 380.
Ryckia, 35; furcata (*De Vriese*), 48, 66.

Sagotia, 227, 262.
Salicaceæ, N. China, 386.
Salix arctica, wood of, found in Arctic regions, (ftnote), 350; babylonica, 386; gracilistyla, 386.
Salvia plebeia, 385.
Salvinia, 212.
Samadera (ftnote) 149; indica, 149.
Sambucus, 323; racemosa, 383.
Sandersonia, 410, charac. of, 452; aurantiaca, 453; littonioides, 453.
Sanicula rubiflora, 382.
Santalaceæ, N. China, 385.
Sapindaceæ, 342; of N. China, 380.
Sapium, 242, 259; heterodoxa, 241; indicum, 242, 243.
Sarcococca, 205, 252.
Sarcocodon (*n. gen.*), charac. of, 169; speciosus, 170.
Sarcodinum, 227.
Sarcothrostachys, 243.
Sauropus, 209, 254.
Savia, 208, 254; clusiæfolia, 209.
Saxifraga (Isomeria) Rossii, 375, 382.
Saxifrageæ, N. China, 382.

Schelhammera, 410, charac. of, 466; multiflora, 465, 466; undulata, 466.
Scheuchzeria pseudo-asphodelus, 487.
Schœnocaulon, 411, charac. of, 476; Coulteri, 476, 477; Drummondii, 476, 477; gracilis, 476, 477; intermedium, 476, 477; officinale, 476; taxanum, 477.
Schoepfia, charac. of genus, 70; arborescens, 71; brasiliensis, 73; chrysophylloides, 75; flexuosa, 72; grandifolia, 74; mexicana, 73; obliquifolia, 73; quintuplinervis, 74; where referred to by botanists, 69.
Schoepfieæ, charac. of, 68.
—— and Cervantesieæ, J. Miers on, 68.
Schoepfiopsis, charac. of genus, 75; acuminata, 77; chinensis, 77; fragrans, 76; jasminodora, 77.
Scidelia, 188, 204, 230, 239.
Scilla japonica, 460.
Sclerocroton ellipticum, 243; reticulum, 243.
Scoliopus, charac. of, 406, 412, 492; Bigelovii, 492.
Scolopendrum sibiricum, 389.
Scorpioid cyme, origin of, 511.
Scorzonera austriaca, 383, and var., 383; macrosperma, var., 383.
Screw-Pines, observations on, by Dr. I. B. Balfour, 33.
Scrophulariaceæ, N. China, 385.
Sebastiania, 242, 259; ligustrina, 243.
Securinega, 208, 212, 253; congesta, 212; elliptica, 212; ramiflora, 386; Schuechiana, 212.
Sedum aizoon, 382.
Seed-structure of Pachira aquatica, 147.
Selaginella involvens, 389.
Selaginelleæ, N. China, 389.
Senapea, 341; belongs to Crescentiaceæ, 341; guianensis, 339.
Senecio, 323; campestris, 383.
Senefeldera, 241, 260.
Septoria magnoliæ, 142.
Sidalchornea, 231.
Silene africa, var. ?, 380; Oldhamia, 380.
Silvæa, 224.
Silver Firs, structure and function of leaves of, 547–551.
Simaba cedron, (ftnote) 149.
Simmondsia, 206, 253.
Siphula ceratites, 562; torulosa, 393.
Siphulei, 393.
Sirosiphon saxicola, 562.
Sisymbrium Alliaria, exper.absorp., 317.
Slateria jaburan, 502; japonica, 501.
Snowberry, exper. absorp., 317.
Sohlms Laubach, Count, his 'Monographia Pandanacearum,' 67.
Solaria, 413, 509; miersioides, 509.
Soliva anthemifolia, 345.
Solorina crocea, 576; saccata, 576.
Some Morphological Notes on certain species of Thunbergia, 1.
Souleyetia freycinetioides (*Gaud.*), 47.
South-African Orchids, note on, 313.
South-American Plants of uncertain position, J. Miers on, 333.
Sowerbæa, 408, charac. of, 416; alliacea, 417; juncea, 416; laxiflora, 417.
Spathodea campanulata, 340.
Speranskia, 227, 228, 263.
Sphærella exutans, 144; lineolata, 17.
Sphæria botulæspora, 143; pertacta, 143; species new or doubtful, 370; texensis, 143; torulæspora, 144; uvæspora, 144.
Sphærophorei, 392.
Sphærophoron australis, 392; compressum, 562; coralloides, 392, 562; fragile, 562.
Sphærostyles, 237, 258.
Spirogyra, 282; pallida, 281.
Spirostachys, 243.
Sporastatia testudinea, (ftnote) 347, 350, 370.
Sporidesmium mundulum, 142.
Sporochnaceæ, 6.
Spruce Firs, structure and function of leaves of, 547–551.
Squamaria crassa, 572.
Stapelia caudata, 162, 169; ciliata, 162; decora, 163; fasciculata, 162, 168; geminata, 163; hirsuta, 162, 166; incarnata, 162; mamillaris, 162; marmorata, 168; olivacea, 171; pilifera, 162; (Orbea) planiflora, 162, 169; pulla, 162; punctata, 162; (Orbea) variegata, 162, 169.
Stapelieæ of Thunberg's Herbarium, with description of four new genera, by N. E. Brown, 162.
Starch, formation of, in meat-fed plants, 24.
Stauroneis anceps, 11; aspera, 11; phœnicenteron, 282; pulchella, 11.
Stawellia, 408, charac. of, 419; dimorphantha, 419.
Steigeria, 225.
Stellaria aquatica (sub Malachio), 380.
Stemmatosiphon, 284.
Stenanthium, charac. of, 406, 407, 411, 483; angustifolium, 484, var. gramineum, 484; frigidum, 484; occidentale, 484, 485; sachalinense, 484, 485.
Stenolobeæ, 200, 204; geograph. distrib. of, 251.
Stenonia, 207.

Stereocaulei, 392.
Stereocaulon arborescens, 156; cymosum, 156; denudatum, 562, β. pulvinatum, 352; evolutum β. fastigiatum, 352; mixtum, 156; paschale, 352; ramulosum, 392; subcæspitosum, 156; tomentosum β. alpinum, 352.
Sticta aurita, 578; damæcornis, 575; fossulata, 396; Freycineti, 396; pulmonaria, 575, var. sorediata, 575; subcaperata, 396.
Stictei, 395.
Stictina carpoloma, 396; crocata, 395; fuliginosa, 573; limbata, 573; scrobiculata, 575; sylvatica, 574.
Stigmatea gregaria, 144.
Stilbum arcticum, 16.
Stillingia, 241, 260; lineata, 243, var. densiflora, 243.
Stipellaria, 231, 257.
Stirton, Dr. J., Remarks on Mr. Crombie's paper on 'Challenger' Lichens, 152.
Stomatocalyx, 241.
Strigilia, (ftnote) 283.
Structure and Habit of Hemileia vastatrix, by D. Morris, 512.
Stylanthus, 233.
Styloceras, 205, 214, 253; columnaris (*Muell. Arg.*), 206.
Stylophorum japonicum, 378.
Styraceæ, J. Miers on, 68.
—— and Symplocaceæ, two Orders, J. Miers on, 283.
Styrax limoncillo, 292.
Sugerokia japonica, 460.
Sumbavia, 227, 263.
Surirella, 282; constricta, 11; ovata, 11; subsala, 11.
Sussea, 35; conoidea, 53, (*Gaud.*) 66; lagenæformis, 50, (*Gaud.*) 66; microcarpa (*Gaud.*), 62, 66; microstigma, 53, (*Gaud.*) 66.
Symphoricarpus, exper. absorp., 317.
Symphyllium, 228; silhetense, 228.
Sympleura, 294.
Symplocaceæ and Styraceæ, two orders, J. Miers on, 283.
Symplocos, 283, charac. of, 285; acuta, 301; Alstonia, 291; apicalis, 302; arborea, 304; arechea, 291; attenuata, 299; bahiensis, 286; baptica, 305; Berterii, 286; bracteata, 301; cærulescens, 305; caudata, 300; celastrinea, 294; cerasifolia, 304; cernua, 290, 292; Ciponima, 288; Clausseni, 287; coccinea, 291; cordifolia, 301; coriacea, 292; coronata, 302; cratægoides, 298; cuneata, 301; elegans, 301; estrellensis, 293; ferruginea, 299; foliosa, 300; Gardneriana, 300; glaucescens, 305; gracilis, 305; grandiflora, 299; Hamiltoniana, 299; Hartwegi, 290; hirsuta, 294, 301; hispidula, 301; japonica, 302, 306; javanica, 302; jucunda, 301; læta, 301; lanceæfolia, 305; lanceolata, 293; laxiflora, 286; Lenormandiana, 304; leptostachya, 306; leucantha, 300; leiostachya, 300; limoncillo, 292; Lohu, 298; lucida, 299, 305, 306; Lundii, 286; macrophylla, 299; marginalis, 301; Martii, 287; martinicensis, 285, var. Berterii, 286; Matthewsii, 292; microcarpa, 302; microphylla, 300; monantha, 300; montana, 305; mucronata, 292; myrtacea, 306; neriifolia, 306; nervosa, 299; nitens, 286; nitida, 305; nuda, 292; obovata, 286, 301; obtusa, 299, 300, var. cucullata, 301, var. obovata, 299, 301; octopetala, 291; oxyphylla, 300; paraënsis, 287; parviflora, 287; parvifolia, 292; pedicellata, 300; pendula, 297; phæoclados, 287; platyphylla, 286; polycarpa, 301; polystachya, 300; prunifolia, 306; pubescens, 286; pulchra, 300; pycnobotrya, 286; pyrifolia, 299; racemosa, 297, 298, 299; ramosissima, 299; ramentacea, 294; reflexa, 292; revoluta, 294; rhamnifolia, 293; ribes, 302; rigida, 299; rotundifolia, 305; rubiginosa, 299; rufescens, 292, 301; Samuntia, 298, var. floribunda, 299; serrulata, 292; sinica, 297; sp., 295; spicata, 298, 304, var. atroviridus, 304, var. oligostachya, 304, var. zeylanica, 304; stravadioides, 304; sulcata, 300; tetrandra, 293; theæfolia, 298; tomentosa, 292; uniflora, 286; variabilis, 293; Verhuelli, 302; Vieillardi, 305; xanthophylla, 302.
Synadenium, 202, 248.
Synedra acus, 282; biceps, 282; fulgens, 12; kamtschatica, 12; superba, 12; tabulata, 12; ulna, 282.
Synergidæ, 526, 536.
Synopsis of Colchicaceæ and the Aberrant Tribes of Liliaceæ, by J. G. Baker, 405; of Hypoxidaceæ, by J. G. Baker, 93.
Synostemon, 210, 253, 254.
Syringa vulgaris, 322, 323, 384.

Tænosapium, 243.
Tagira, 238.
Tannodia, 272.

Taraxicum officinale, 383.
Taxus baccata, absorp. leaf, 322, 323.
Tecophilæa, 412, 495; albida, 496; cyaneo-crocea, 496, var. Regelii, 496; violæflora, 496.
Telogyne, 225.
Tendrils of Ampelopsis americana, 308; A. Veitchii, 308; A. hederacea, 309; Bignonia capreolata, 308; B. dioica, 309; Hanburyia mexicana, 309; Hoplolophium, 308; Vitis gongylodes, 306.
Teta viridiflora, 505.
Tetragastris, 233.
Tetraplandra, 245.
Tetrorchidium, 218, 229, 262.
Texas, the Fungi of, 141.
Thalassiosira Nordenskioldii, 12.
Thamnodia vermicularis, 393, 559, var. β. taurica, 352.
Thamnomyces patagonicus, 555; setiformis, 555.
Thecacoris, 217, 261.
Thelotrema lepadinum, 399.
Thesium chinense, 385.
Thlaspi arvense, 378.
Thuja, sp., absorp. leaf, 322.
Thunbergia alata, 1, 2; coccinea, 2; erecta, 2; fragrans, 2; grandiflora, 2; laurifolia, 1, 2.
——, Morph. Notes on, by M. Hartog, 1.
Thunbergii, 388.
Tiglium, 256.
Tilia, absorp. dew, 323; mandshurica, 380.
Tiliaceæ, N. China, 380.
Tirucalli, 249.
Tithymalus, 202, 249.
Tofieldia, 406, 412, charac. of, 485; allemanica, 487; alpina, 487; anthericoides, 487; borealis, 486; calyculata, 486; cernua, 486, 487; coccinea, 487, var. major, 487; falcata, 486, 489; flexuosa, 489; frigida, 489; glaberrima, 489; glabra, 486, 489; glacialis, 487; glutinosa, 490; gracilis, 486, 488; himalaica, 486, 489; japonica, 491; nuda, 488, 486; nutans, 486, 487; palustris, 486, 487; pubens, 490; pubescens, 491; pusilla, 486; racemosa, 487; rubra, 487; sessiliflora, 489; sordida, 486, 488; stenantha, 486, 488; stenopetala, 487.
Tofieldieæ, charac. of, 411.
Tolypothrix glacialis, 8.
Tovaria japonica, 387; Rossii, 387.
Toxicodendron, 214, 263; acutifolium, n. sp. characterized, 214.
Tragia, 188, 230, 238, 258; volubilis, 258, 260.
Trapa bispinosa?, 281.
Treireodendron, 213.
Trewia, 232, 264.
Triantha, 403, 412, charac. of, 490; glutinosa, 490; japonica, 491; pubens, 490.
Triceratium arcticum, 10, 12.
Trichlora, 413, charac. of, 508; peruviana, 509.
Trichobasis Pyrolæ, 16.
Trichocaulon, n. gen., charac. of, 164; flavum, 165; piliferum, 164.
Tricyrtis, 410, charac. of, 463; elegans, 464; flava, 463, 464; formosana, 463, 465; hirta, 463, 464; japonica, 464; latifolia, 463, 464; macropoda, 463, 464; pilosa, 463, 464.
Trifolium, absorp. dew, 323.
Trigella orchidiformis, 497.
Trigonostachys lævigatus, 225.
Trigonostemon, 224, 263; Beddomi, 221; Cumingii, 221; Gaudichaudi, 221; zeylanicus, 225.
Trigonotis peduncularis, 384.
Trimen, Dr. H., Note on the genus Oudneya, 328.
Tripinnaria (*DC.*), 341.
Tripladenia Cunninghami, 465.
Trisyngyne, 241.
Tritaxis, 221, 225, 263.
Tryblionella marginata, 12.
Trypethelium cruentum, 401.
Tubercularia vulgaris, 563.
Tubers in Begonia, 307; in Dioscorea, 307.
Tuckeya, 35; candelabrum (*Gaud.*), 42, 66.
Tulipa Breyniana, 446.
Tussilago, absorp. dew, 323.
Tylosepalum, 225.

Uapaca, 263.
Ulmaceæ, N. China, 386.
Ulmus campestris, 386; ? N. China, (ftnote) 375.
Ulva latissima, 7.
Ulvaceæ, 7.
Umbelliferæ, N. China, 382.
Umbilicaria pustulata, 576.
Urceolaria scruposa, 564; subocellata, 399.
Urnula Hartii, 13, 16; craterium, 16.
Urtica, absorp. dew, 323.
Usnea albopunctata, 544; articulata, 544; ceratina, 394, 544; dasypoga,

555; florida, 393, 555; hirta, 555, f. minor, 555, f. sorediata, 555; plicata, 554; trigosa, 555; sulphurea, (ftnote) 347.
Usneei, 393.
Utricularia minor, 158; sp.?, 281; trap of, 17.
Utricularieæ, charac. of, 409.
Uvularia, 410, charac. of, 461; cirrhosa, 463; flava, 462; floridana, 461, 463; grandiflora, 461, 462; hirta, 464; lanceolata, 462; perfoliata, 461, 462, var. minor, 462; puberula, 461, 462; sessiliflora, 461, 462.

Vahea, 338.
Valeriana officinalis, 383.
Valerianeæ, N. China, 383.
Vallisneria spiralis, 281, 345.
Venturia Myrtilli, 17.
Veratreæ, charac. of, 411.
Veratrum, 411, charac. of, 469; album, 470, 471, var. grandiflorum, 471, var. parviflorum, 472, var. virescens, 471, var. viridiflorum, 471; americanum, 468; angustifolium, 484; californicum, 471, var. Watsoni, 471; caricifolium, 477; Dubouzetii, 474; Eschcholtzii, 471; fimbriatum, 470, 472; frigidum, 484; intermedium, 470, 473; Lobelianum, 471; luteum, 468; Maackii, 470, 473; malayanum, 474; Maximowiczii, 470, 472; nigrum, 470, 472, 474, var. japonicum, 472; officinale, 476; oxysepalum, 471; parviflorum, 470, 471, 472; Sabadilla, 474; stamineum, 470, 471; tenuifolium, 477; virescens, 474, 483; viride, 471; Woodii, 470, 474.
Veronica chamædrys, absorp. leaf, 319.
Verrucaria cinchonæ, 155; microspora, 367; phæothelena, 366; popularis, (ftnote) 346; prostans, 155; scopularia, 368; striatula, 367.
Viburnum burejaeticum, 383; opulus, 383; Tinus, absorp. leaf, 322, 323.
Vicia pseudo-orobus, var.?, 381.
Vinca major, absorp. leaf, 319.
Vincetoxicum sibiricum, 384.
Vinsonia, 35; acuminata, 40, 66; consanguinea, (*Gaud.*), 65, 66; drupacea, 42, 59, 66; elegans (*Gaud.*), 62, 66; humilis (*Gaud.*), 66; lucida (*Gaud.*),62, 66; macrostigma (*Gaud.*) 65, 66; media (*Gaud.*), 65, 66; palustris (*Gaud.*), 65, 66; Pervilleana (*Gaud.*), 42, 66; propinqua (*Gaud.*), 65, 66; purpurascens, 59, 67; stephanocarpa (*Gaud.*), 65, 67; striata (*Gaud.*), 65, 67; sylvestris (*Gaud.*), 42, 67; Thouarsii (*Gaud.*), 65, 67; utilis (*Gaud.*), 65, 67, var. stephanocarpa (*Ad. Br.*), 65.
Viola, cleistogamic flowers of, 269; alba, 271; biflora, 379; canina, 271, 280, β. acuminata, 379, var. N. China, 379; cucullata, 269; elatior, 275; floribunda, 274; hirtipes, 379; odorata, 270, 280; Patrinii, 379; phalacrocarpa, 379; pinnata var. dissecta, 379; sagittata, 275; sylvatica, 269, 272; tricolor, 279; variegata, 379; verecunda, 379.
Violaceæ, N. China, 379.
Viscum album, 385.
Viti, a kind of S.-Amer. timber, (ftnote) 334.
Vitis gongylodes, on branch tubers and tendrils of, 306–308; amurensis, 381; pentaphylla, 381; tricuspidata, 308; Veitchi, 308.

Wachendorfia, 94.
Walleria, 407, 412, charac. of, 498; angolensis, 499; Mackenzii, 499, var. nutans, 499.
Ward, H. Marshall, Contrib. to our Knowledge of Embryo-sac in Angiosperms, 519.
Wartmannia, 240.
Weale, W. Mansell, note on South-African Orchids, 313.
Weldenia, charac. of, 406, 410, 454; candida, 454.
Wetria, 231, 257.
Wetriaria, 237.
Wielandia, 208.
Williamia, 211, 254.
Willows of N. China, (ftnote) 375.
Winged Cardamom of Nepal, 3.
Wistaria sinensis, 90; absorp. leaf of, 319; Dyer *versus* Meehan on, 332; note on fruiting of, 329; supported forms produce shoots and flowers, 91, 92; tree-forms seed abundantly, 91; vegetative and reproductive forces of, 92.
Woodsia polystichoides, 389; manchuriensis, 389.
Wurmbea, 409, charac. of, 435; campanulata, 435; Drummondii, 435, 436; Kraussii, 435, 437; longiflora var., 436; pygmæa, 435, 437; tenella, 435, 437; tenuis, 435, 436; tubulosa, 435, 436.

Xanthoria parietina β. aureola, 354; lychnea β. pygmæa, 354.
Xerophyllum, 410, charac. of, 467;

asphodeloides, 467, var. tenax, 467; gramineum, 484 setifolium, 467.
Xiphidium, 94.
Xylophyllum, 211, 254.

Zephyra, 412, charac. of, 495; amœna, 495; elegans, 495.
Zizyphus vulgaris, var. inermis, 380.
Zonotrichia sp.? near Z. fluviatilis, 8.
Zuckertia, 239.
Zwingera, (ftnote) 149.
Zygadenus, 411, charac. of, 479; bracteatus, 482; canadensis, 482; chloranthus, 482; commutatus, 482; Douglasii, 480; elegans, 482; Fremonti, 480, var. minor, 480; glaberrimus, 479, 480; glaucus, 480, 482; hybridus, 475; japonicus, 473; leimanthoides, 480; monœcus, 473; Nuttallii, 480, 481; paniculatis, 481; sibiricus, 483; speciosus, 482; virginicus, 475; volcanicus, 482.
Zygnemaceæ, 7.
Zygogonium Agardhii, var. nigricans, 7.
Zygophyllidia, 251.

END OF THE SEVENTEENTH VOLUME.

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

J.N.Fitch lith.

SCHŒPFIA ARBORESCENS.

Fitch imp.

J N Fitch lith

SCHŒPFIOPSIS ACUMINATA.

Fitch imp

Fitch lith. CERVANTESIA KUNTHIANA Fitch imp

J.N.Fitch lith. IODINA RHOMBIFOLIA Fitch imp.

J.N.Fitch lith.

MYOSCHILOS OBLONGA.

Fitch imp.

J.N. Fitch lith. ARJONA RIGIDA. Fitch imp.

QUINCHAMALIUM CHILENSE

J.N.Fitch lith. GERMINATION OF PACHIRA AQUATICA Fitch imp.

MABURA FRANCOANA

J N Fitch lith. MARUPA PARAENSIS. Fitch imp.

J.N.Fitch lith. TRICHOCAULON, BOUCEROSIA & STAPELIA Fitch imp.

1
2
3
4
5
6
7
8
9
10
11
12
13

Rev R. Abbay del.

HEMILEIA VASTATRIX

J. N. Fitch lith. et imp.

Rev. R Abbay del

HEMILEIA VASTATRIX.

J N Fitch lith et imp.

W.Fitch lith. VITIS GONGYLODES, *Baker.* Fitch imp.

EMM del.
J.N.Fitch lith.

Fitch imp.

1,2. ANEMONE ROSSII. 3,4. LEONTICE MICRORHYNCHA, & 5, VAR. VENOSA. 6. VIOLA HIRTIPES.
7. DRACOCEPHALUM SINENSE. 8_10. BETULA EXALTATA.

J.M. Ward, del.

F Huth Lith^r Edin^r

BUTOMUS UMBELLATUS

H. M. Ward, del. F. Huth, Lith[r] Edin[r]

BUTOMUS UMBELLATUS.

H. M. Ward, del. F. Huth, Lith[r] Edin[r]

BUTOMUS UMBELLATUS.

H M Ward, del.

F Huth, Lith' Edin'

ALISMA PLANTAGO.

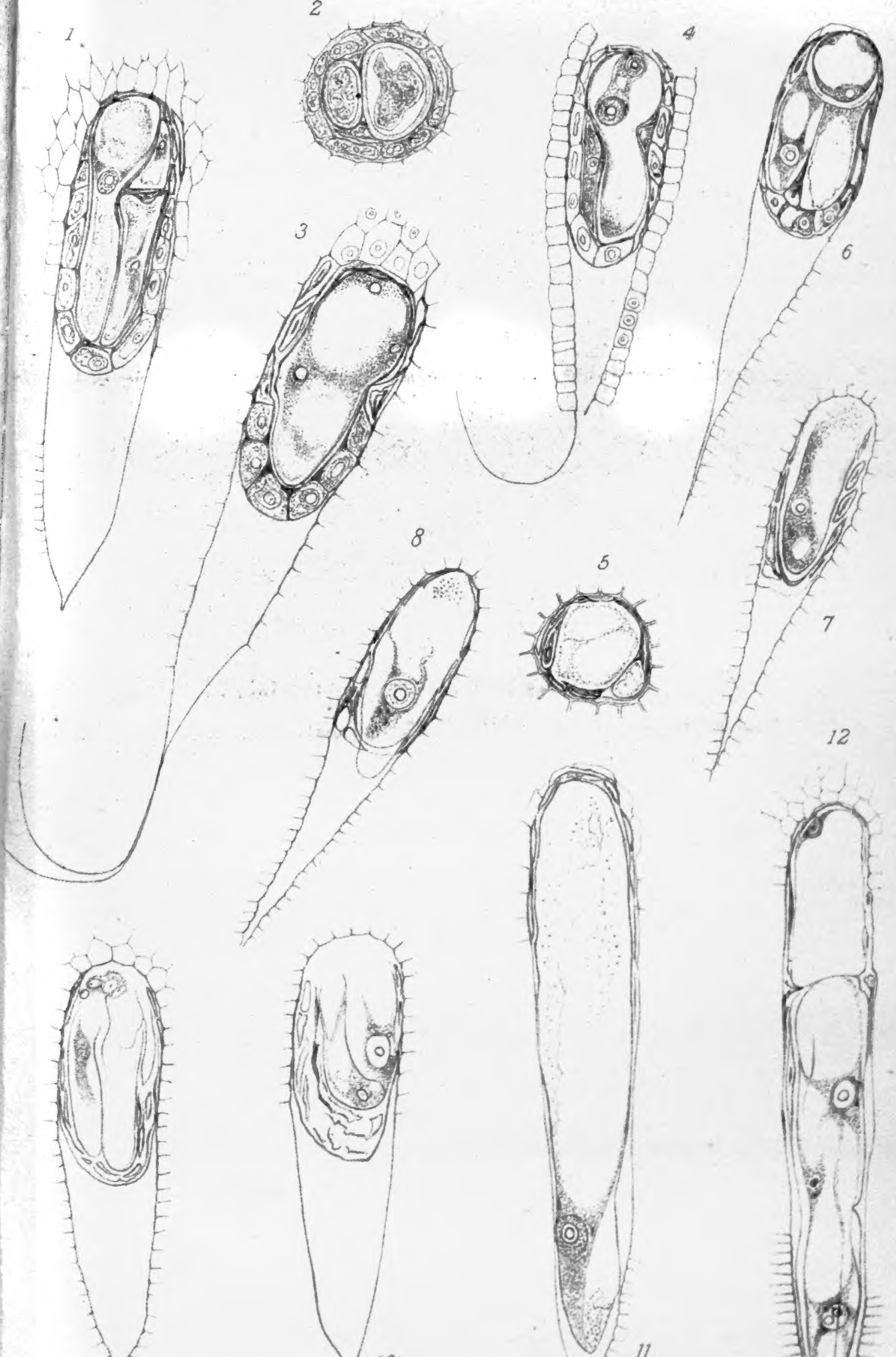
H. M. Ward, del.

F. Huth, Lith[r] Edin[r]

1-8. ANEMONE JAPONICA. 9-11 LUPINUS VENUSTA.

H.M.Ward del.

D.Blair lith. 1-4 ŒNOTHERA BIENNIS. 5-11 PYRETHRUM BALSAMINATUM. Fitch imp.



D.Blair lith. PYRETHRUM BALSAMINATUM. Fitch imp.

J.N.Fitch lith. Fitch imp.

1.3. PYRETHRUM BALSAMINATUM. 4.9. ANTHEMIS TINCTORIA.

J.N.Fitch lith.

Fitch imp.

1. ANTHEMIS TINCTORIA.
2,3. VERBASCUM PHLOMOIDES. 4-12. LOBELIA SYPHILITICA.